

Name : _____ ()

Class : 3E1



GreenRidge Secondary School

End-of-Year Examination 2002

Subject : Chemistry (5068)
Secondary Three Express
Paper 2

Date : 15 Oct 2002

Duration : 1 h 45 mins

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INSTRUCTIONS TO CANDIDATES

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

HAND UP YOUR ANSWERS TO EACH SECTION SEPARATELY.
DO NOT STAPLE THEM TOGETHER.

Section A

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

Section B

Answer **ALL 3** questions. Write your answers on the separate foolscap paper provided. 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

This paper consists 10 printed pages, including this page.

Section A [50 marks]

Answer ALL questions in the spaces provided.

A1. (a) What is meant by 'catalyst'? [1]

(b) Name a catalyst used for each of the following conversions.

(i) nitrogen to ammonia [1]

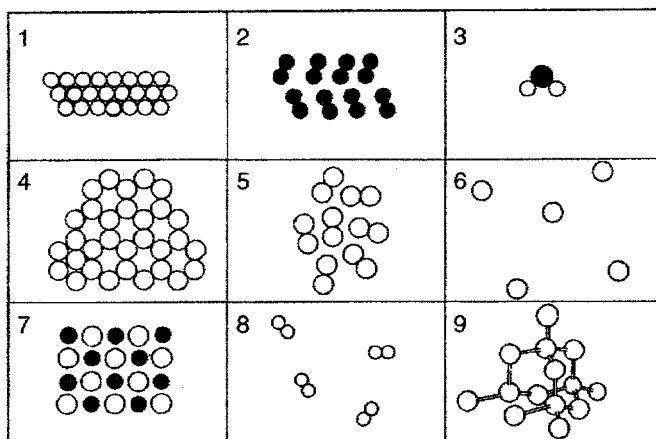
(ii) hydrogen peroxide to oxygen [1]

(iii) sulphur dioxide to sulphur trioxide [1]

(iv) an alkene to an alcohol [1]

A2. A mixture of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ and $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ is heated at 120°C until a mixture of the anhydrous salts is obtained. If 5.00 g of the mixture gives 3.00 g of the anhydrous salts, calculate the percentage by mass of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ in the mixture. [2]

A3. Models of various structures are shown below



- (a) Which structure represents a gas existing as monoatomic particles?
Give an example.

structure _____

example _____.

[2]

- (b) Which structure represents a molecule of sulphur dioxide?

structure _____

[1]

- (c) Which structure represents a gas consisting of diatomic molecules?
Give an example.

structure _____

example _____.

[2]

- (d) (i) Which structure represents a layer of atoms in graphite?

structure _____

[1]

- (ii) State a property of graphite which depends on its layered structure.
Explain how this property is related to the structure.

structure _____

example _____.

[2]

A4. "Calcium is a more reactive metal than iron."

- (a) Describe carefully **two reactions** which you could carry out to confirm the statement above. Write **equations** for the reactions you describe. [4]

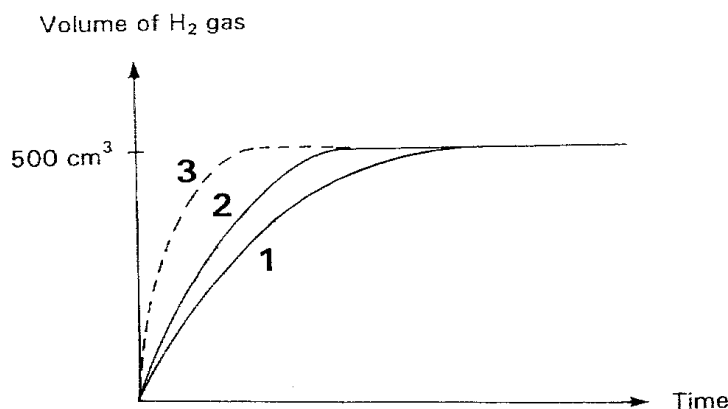
(b) Magnesium chloride is an ionic solid.

- (i) Give the formulae for the particles present in this solid. [1]

- (ii) Under what conditions is magnesium chloride able to conduct an electric current? Explain. [2]

A5. A student placed 0.5 g of metal X into a flask containing 80 cm³ of 1M HCl. The volume of hydrogen gas at r.t.p. was measured at regular intervals. The whole experiment was repeated using 0.5g of metal X and 50 cm³ of 2M HCl. Metal X belongs to Group II of the Periodic Table.

<i>Experiment</i>	<i>Mass of Metal X</i>	<i>Volume and Concentration of HCl</i>
1	0.5g	80cm ³ / 1M
2	0.5g	50cm ³ / 2M



- (i) Which reagent is in excess, metal **X** or HCl in experiment 1? Explain. [2]

- (ii) Calculate the relative atomic mass of metal **X**. [1]

- (iii) Suggest a method for measuring the volume of hydrogen gas liberated. [1]

- (iv) Using 0.5g of metal **X** and 50cm³ of 2M HCl, suggest **two** different methods to obtain curve 3. [2]

- A6. Complete the following table. [4]

Symbol of element	Atomic Number	Mass Number	Number of		
			Protons	Neutrons	Electrons
Na ⁺	11	24	11		
O ²⁻	8		8	9	
N ³⁻	7	14		7	
H ⁺	1	1	1		

A7. By means of suitable electron diagrams, illustrate the bonding in the following two compounds.

(Show only outermost electron shells)

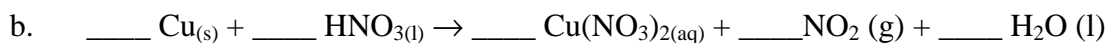
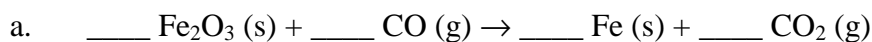
[4]

a. Calcium chloride

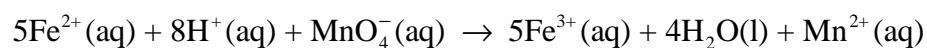
b. Ethene (C₂H₄)

A8. Balance the following equations:

[4]



A9. Aqueous iron(II) ions react with acidified aqueous potassium manganate(VII) according to the equation below.

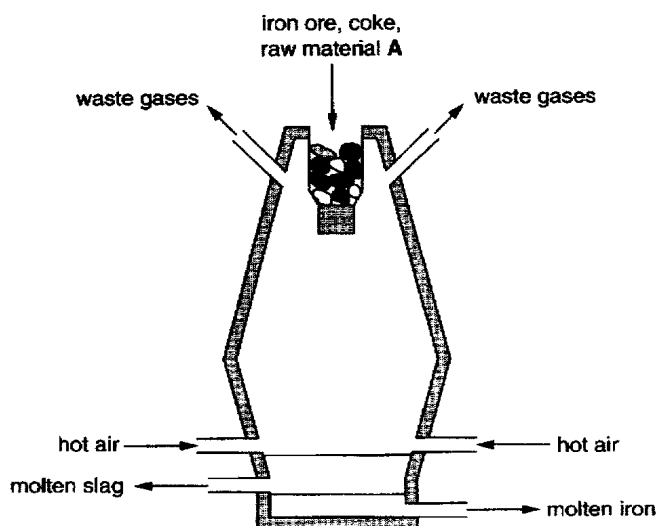


a. What is the oxidising agent in this reaction? Explain your answer.

[2]

- b. Describe briefly how aqueous potassium iodide can be used to test for an oxidising agent. [2]

A10. The diagram shows the Blast Furnace.



- (a) (i) Name raw material A. [1]

- (ii) Explain why A is added to the Blast Furnace. [1]

- (b) (i) Name the gaseous reducing agent in the furnace. [1]

- (ii) Construct an equation for a reaction in which it is produced. [1]

- (c) Calculate the maximum mass of iron that can be obtained from 80g of pure iron(III) oxide. [2]

Section B [30 marks]

Answer ALL questions from this Section on the foolscap paper provided.

Question B1

- (a) The table below gives the estimated percentages by mass of some of the elements found in the Universe, the Earth's core and the Earth's crust.

I		II		III	
Universe	%	Earth's core	%	Earth's crust	%
hydrogen	90.0	iron	35.0	oxygen	52.5
helium	8.9	oxygen	28.0	silicon	31.0
carbon	1.0	magnesium	17.0	aluminium	6.0
oxygen	} less than 0.1	silicon	13.0	iron	5.0
magnesium		nickel	2.7	calcium	4.0
iron		aluminium	0.1	titanium	0.5
sulphur		sodium	0.1	hydrogen	0.15
silicon		hydrogen	0.05	nickel	0.05

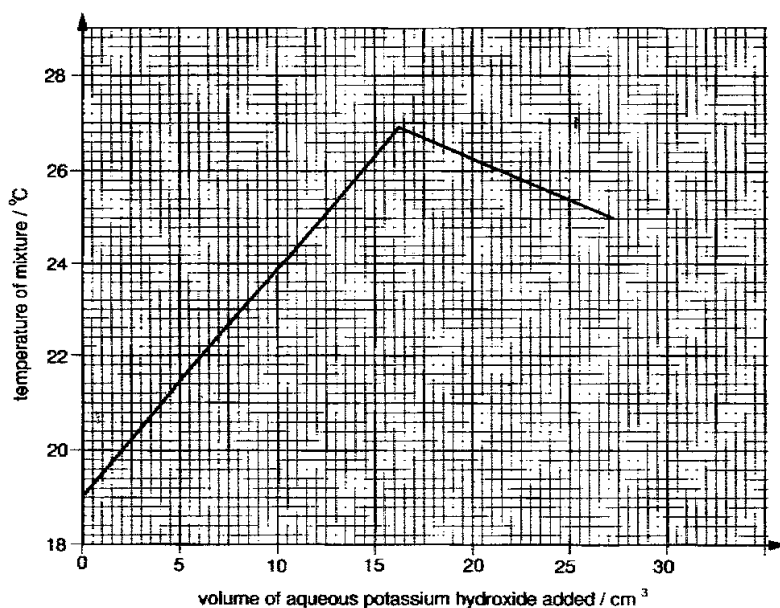
- (i) Which ELEMENT is more common in the Universe than it is in either the Earth's crust or the Earth's core? [1/2]
- (ii) Which of the METALS shown both in column II and in column III is more abundant in the Earth's crust than it is in the Earth's core? [1/2]
- (iii) Which of the METALS shown both in column II and column III are more abundant in the Earth's crust? [1]
- (iv) Suggest why the figures for the percentages of the elements in the Earth's core may not be reliable. [1]
- (b) The amount of metal ores in the Earth's crust is limited and non-renewable and there is a need for conservation and recycling of metals.
- (i) Explain what is meant by the recycling of metals. [1]
- (ii) Give two ways of conserving metals. [2]
- (iii) Discuss the importance of recycling of metals. [2]
- (c) What are the factors that determine the choice of one metal over another for making things? [2]

Question B2

Aqueous potassium hydroxide is an alkali.

- (a) Name the salt formed when aqueous potassium hydroxide reacts with dilute sulphuric acid. [1]
- (b) Aqueous potassium hydroxide is gradually added to dilute sulphuric acid until it is in excess.
- (i) Write the ionic equation for this reaction.
- (ii) What happens to the pH value of the mixture during the addition? [2]

- (c) The temperature of the mixture initially begins to rise as the potassium hydroxide is added to the sulphuric acid. It then reaches a maximum and eventually falls as more potassium hydroxide is added.



The graph shows how the temperature of the mixture varies with the volume of aqueous potassium hydroxide added.

- (i) Why does the temperature initially rise? [1]
 - (ii) What volume of aqueous potassium hydroxide gives the highest temperature reading? [1]
 - (iii) Explain why the temperature falls if more than this volume of aqueous potassium hydroxide is added. [2]
- (d) Nitrates decompose when they are heated. The decomposition products of magnesium nitrate, $\text{Mg}(\text{NO}_3)_2$, are magnesium oxide, MgO , a brown gas nitrogen dioxide, NO_2 , and a colourless gas which relit a glowing splint.
- (i) Name the colourless gas. [1]
 - (ii) Construct the equation, including state symbols, for the decomposition. [2]

Question B3

- (a) In both liquids and gases, the molecules present are moving.
- (i) Compare the movements and the spacing between the molecules in a gas with those in a liquid. [2]
 - (ii) How do these movements change as the temperature is increased? [1]
 - (iii) Use your answer to (ii) to explain how the rates of chemical reactions change as the temperature of the reaction mixture is increased. [1]
- (b) Hydrogen chloride is a neutral gas and dissolves in water to form an acidic solution.
- (i) Explain why dry hydrogen chloride gas is neutral. [1]
 - (ii) Explain why aqueous hydrogen chloride is acidic. [1]
 - (iii) Describe how sodium carbonate can be used to confirm that an aqueous solution contains an acid. [1]
- (c) The oxides of elements may be acidic, basic or amphoteric. Give the name and formula of one example of each of these three types of oxides. [3]

~ The End ~

