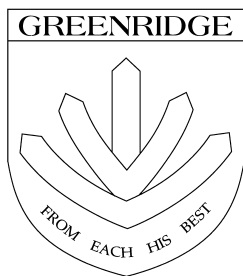


Name : _____ () Class : 4E1



GreenRidge Secondary School

Preliminary Examination 2001

Subject : Chemistry (5069)
Secondary Four Express
Paper 2

Date : 25 Sep 2001

Duration : 1 h 30 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.

Write your answers in the spaces provided on the question paper.

Section B

Answer any **three** questions.

Write your answers on the separate foolscap paper provided.

At the end of the examination, fasten any separate answer paper securely to the question 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 11**.

FOR EXAMINER'S USE	
Section A	/45
Section B	/30
Total	/75

This paper consists of 11 printed pages, including this page.

Section A (45 marks)

Answer **ALL** questions from this Section.

1. Write the name of one example of each of the following: [4]

(a) a green solid which decomposes on heating to form carbon dioxide;

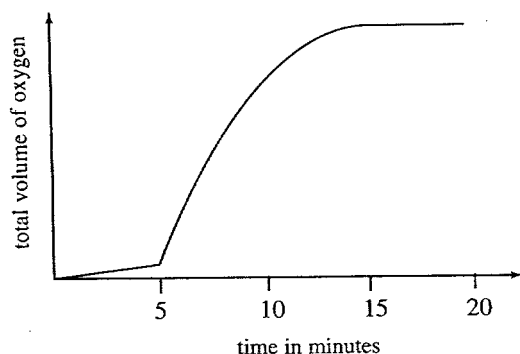
(b) a gas which turns moist red litmus paper blue;

(c) an acid that forms a white precipitate when mixed with aqueous barium nitrate;

(d) a metal which is extracted by electrolysis.

2. A solution of hydrogen peroxide was allowed to decompose and the oxygen given off was collected. The graph shows the change in the total volume of oxygen evolved with time.

A black solid was added to the solution at 5th minute.



a. What effect has the black solid had on the rate of the reaction? [1]

b. What is the general name given to compounds causing this effect? [1]

c. Write the equation, including state symbols, for the decomposition of hydrogen peroxide. [1]

- d. Calculate the maximum volume of oxygen, measured at room temperature and pressure, which can be obtained by this reaction from 1.7 g of hydrogen peroxide. [2]

3. The table gives some information about the formation of salts. Complete the table below. [3]

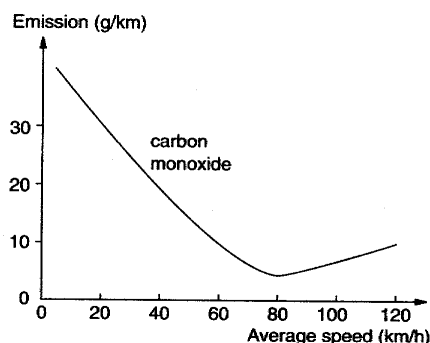
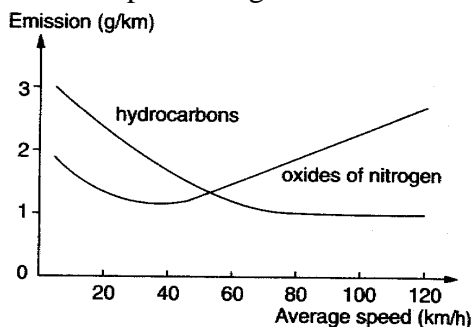
Reactant 1	Reactant 2	Salt produced	Other products formed (may be more than one)
Magnesium	Hydrochloric acid		
		Lead (II) sulphate	Sodium nitrate
	Sulphuric acid	Copper (II) sulphate	

4. a. Apart from fuel, what is the other substance needed for combustion or burning? [1]

- b. Petrol is a hydrocarbon. What are the products of complete combustion of petrol in a car engine? [1]

- c. How does the supply of air affect the products of combustion? [1]

- d. The graphs below show approximately how the emissions of hydrocarbons, oxides of nitrogen and carbon monoxide vary with speed. Emissions are measured in g/km, but note the scale for carbon monoxide emissions are ten times greater than that for the other two pollutant gases.



- (i) What speed is best for reducing the emission of hydrocarbons? [1]

- (ii) What speed is best for reducing the emission of carbon monoxide? [1]

- (iii) What speed is best for reducing the overall emission of these gases? [1]

5. Aluminium is extracted from its ore, bauxite, by the process of electrolysis.

- (a) Write the equation for the reaction occurring at the positive and negative electrodes. [1]
- (i) Reaction at positive electrode [1]

- (ii) Reaction at negative electrode [1]

- (b) Explain why graphite anode need to be replaced at regular intervals. [1]

- (c) Why is a mixture of cryolite and aluminium oxide and not just aluminium oxide alone used as an electrolyte? [2]

- (d) Aluminium is used to produce food containers because it does not corrode easily.
Explain why aluminium does not corrode easily. [1]

6. The Haber Process involves a reversible reaction between nitrogen and hydrogen to make ammonia.

- (a) Write the equation for the reaction used in the Haber process. [1]

- (b) Explain in terms of collisions between molecules why increasing the pressure increases the rate of this reaction. [1]

- (c) State the actual conditions and catalyst used industrially in the Haber Process. [3]

7. When chlorine gas is passed into aqueous potassium iodide solution, the yellow-green colour of the chlorine disappears and the solution turns brown.

- (a) Construct an ionic equation (include the state symbols) for this reaction. [1]

- (b) Name the substance that has been reduced. [1]

- (c) Name the oxidising agent in this reaction. [1]

8. Hydrogen reacts with chlorine to produce hydrogen chloride. This reaction is exothermic. During the reaction, covalent bonds are broken and new covalent bonds are formed.

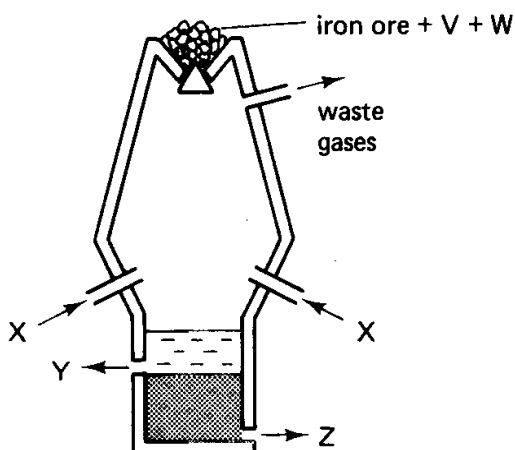


- (a) What type of energy change occurs when bonds are broken? [1]

- (b) What type of energy change occurs when bonds are formed? [1]

- (c) Which is the larger of the energy changes taking place in the reaction above, bond breaking or bond forming? Explain your answer. [2]

9. Iron is manufactured from haematite, an oxide of iron. The following diagram shows a simple outline of the furnace:



- (a) Give the names of the three raw materials, V, W and X. [2]

- (b) Give the names of the two products Y and Z. [1]

- (c) The chemical that reacts with iron ore to produce iron is carbon monoxide. What is the purpose of carbon monoxide in this reaction? [1]

10. Fertilisers are added to the soil to replenish minerals which are essential for plant growth.

(a) Name three nutrients important to plant growth. [3]

(b) Name two important nitrogenous fertilisers. [2]

Section B (30 marks)

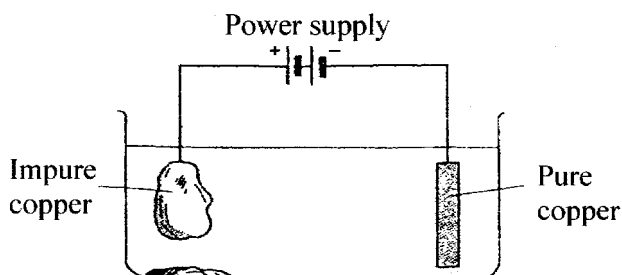
Answer **THREE** questions from this Section.

Each question is allocated **TEN** marks

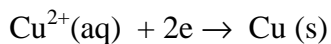
B1. Explain each of the following observations. Write equations for any reactions described.

- (a) A solution of hydrogen chloride in methylbenzene **does not** conduct an electric current and does not react with magnesium.
A solution of hydrogen chloride in water **does** conduct a current and reacts rapidly with magnesium. [2]
- (b) When lumps of calcium carbonate are added to dilute nitric acid a continuous stream of bubbles is seen.
When lumps of calcium carbonate are added to dilute sulphuric acid only a few bubbles of gas are seen and the reaction stops prematurely. [3]
- (c) Addition of iron to aqueous copper(II) sulphate results in a colour change from blue to pale green and a pink precipitate is formed.
Addition of iron to aqueous magnesium sulphate results in no change in colour. [2]
- (d) When dilute sulphuric acid is exactly neutralized by aqueous sodium hydroxide the resulting mixture is a very good conductor of electricity.
When dilute sulphuric acid is exactly neutralized by aqueous barium hydroxide the resulting mixture is a very poor conductor of electricity. [3]

B2. (a) Copper can be purified by electro-refining. The process is shown in the diagram below.



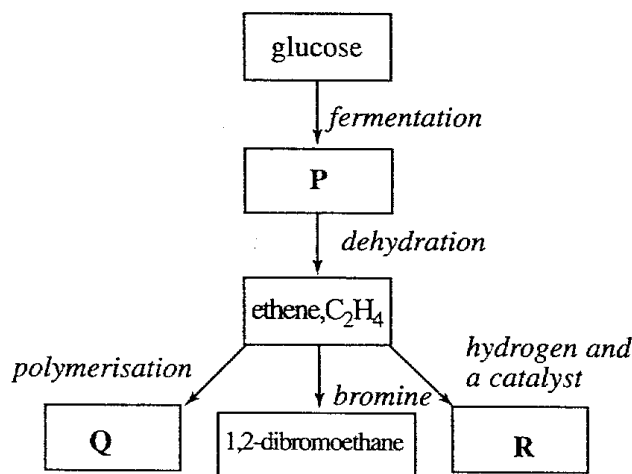
The ionic equation for the process occurring at the negative electrode is



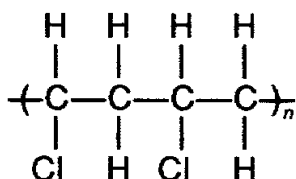
- (i) Explain, in terms of electron transfer, why the reaction at the negative electrode is known as reduction. [1]
- (ii) Suggest a possible electrolyte that can be used in the process shown in the diagram. [1]
- (iii) During the electro-refining, what happens to the concentration of the electrolyte? [1]
- (iv) Explain why the negative electrode must be pure copper. [2]

- (b) What is electroplating? [1]
- (c) Industrially electrolysis can be used to chromium plate other metals. [1]
- (i) Suggest two reasons why chromium plating is used. [2]
- (ii) Name one other metal which can be used to plate metals. [1]
- (iii) Why is electroplating a good method of applying a coat of metal instead of dipping the object into the molten metal? [1]

- B3. (a) Carefully study the reaction scheme below and use it to answer the questions that follow.



- (i) Give the names of the substances and the conditions needed to ferment glucose. [2]
- (ii) Give the name of the gas that is also produced during the fermentation of glucose. [1]
- (iii) Give the structural formula for substance P. [1]
- (iv) Give the names of substances Q and R. [1]
- (v) Write the equation for the addition reaction between ethene and bromine. [1]
- (b) The diagram represents the structure of a common plastic.



- (i) Draw the structure of the monomer from which it is made. [1]
- (ii) This plastic is non-biodegradable. Explain the meaning of this term and describe the problems which this property causes. [1]

If this plastic is burned, a thick, black smoke and a very acidic gas are produced.

- (iii) Suggest the identity of the black particles in the smoke. [1]
- (iv) Suggest the identity of the very acidic gas. [1]

- B4. (a) Explain the following terms:
- (i) Addition polymerisation [2]
 - (ii) Condensation polymerisation [2]
- (b) Propene can undergo addition polymerisation to form poly(propene).
- (i) Write an equation for the formation of poly(propene). [1]
 - (ii) Give **one** household particle that can be made from poly(propene). Give an **advantage** of having it made from poly(propene) instead of glass or metal. [2]
- (c) Suggest a name for the polymer which is made from addition polymerisation of the monomers - vinyl acetate [1]
- (d) Ethanol and ethanoic acid react in the presence of concentrated sulphuric acid to yield ethyl ethanoate and water.
- (i) Write a balanced equation for the above reaction. [1]
 - (ii) What is the function of concentrated sulphuric acid in this reaction? [1]

~ The End ~

The Periodic Table of the Elements

Group																										
I	II	III	IV	V	VI	VII	0																			
7 Li Lithium 3	9 Be Beryllium 4	<table border="1" style="margin: auto;"> <tr> <td style="text-align: center;">I</td> <td style="text-align: center;">H Hydrogen 1</td> </tr> </table>																I	H Hydrogen 1	11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10	4 He Helium 2
I	H Hydrogen 1																									
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	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	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 Yttrium 39	91 Zr Zirconium 40	96 Mo Molybdenum 42	101 Ru Ruthenium 44	103 Rh Rhodium 45	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	184 W Tungsten 74	190 Os Osmium 76	192 Ir Iridium 77	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	210 Rn Radon 86													
87 Fr Francium	88 Ra Radium	89 Ac Actinium	+											86												

* 58 – 71 Lanthanoid series
+ 90 – 103 Actinoid series

a	X
b	
Key	

a = relative atomic mass
 X = atomic symbol
 b = proton (atomic) number

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.)