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**NATIONAL EXAMINATION 2002/2003**

**SUBJECT: CHEMISTRY III**

**LEVEL : ORDINARY LEVEL**

**DURATION: 3 HOURS**

**INSTRUCTIONS:**

Answer ALL questions in Section A,

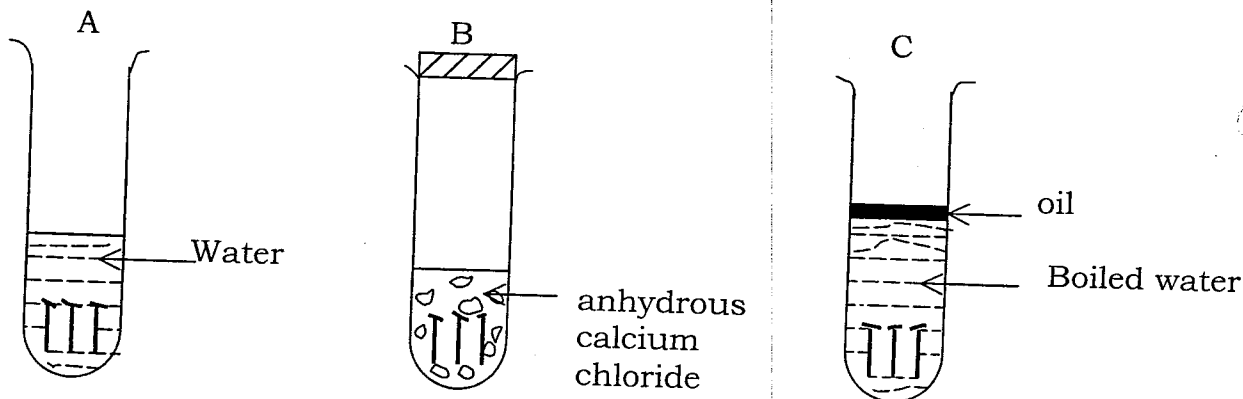
Choose THREE questions from Section B and ONE question  
from Section C.

Calculators may be used.

**SECTION A: Answer ALL questions in this section.**

1. Air is a mixture of several different gases.
  - (a) Name a gas in air that supports combustion. **(1mark)**
  - (b) Name a gas that causes global warming. **(1mark)**
  - (c) Name a gas that is chemically inactive. **(1mark)**
  - (d) Name a gas that makes the biggest part of air. **(1mark)**

2. The iron nails were placed in test tubes under different conditions. Study the diagrams carefully and answer the questions that follow.



- (a) In which of the test tubes will be nails rust? **(1mark)**
  - (b) What is the purpose of anhydrous calcium chloride in tube B? **(1mark)**
  - (c) Why is boiled water used in tube C? **(1mark)**
3. The table below shows the melting points and boiling points in degrees centigrade of substances A to C. Study the table carefully and answer the questions that follow.

Substance	Melting point	Boiling point
A	1009	2506
B	- 256	- 248
C	- 10	63

- (a) What do you understand by melting point? **(2marks)**
  - (b) Which substance is a gas at room temperature of 20°C? **(1mark)**
  - (c) Which substance is a metal? **(1mark)**
4. (a) Write the chemical formulae for the following compounds. **(1mark)**
- (i) Sulphuric Acid. **(1mark)**
  - (ii) Sodium Phosphate.

(b) Complete the following word equation. (1½marks)  
 Sulphuric Acid + Sodium Carbonate  $\longrightarrow$

5. Study the following equation and answer the questions that follow.



(a) Name the oxidising agent in the above reaction. (1mark)

(b) Calculate the mass of  $\text{Fe}_2\text{O}_3$  that would be required to produce 112 grams of Fe. (2½marks)  
 Atomic masses are: Fe = 56 , O = 16 , C = 12

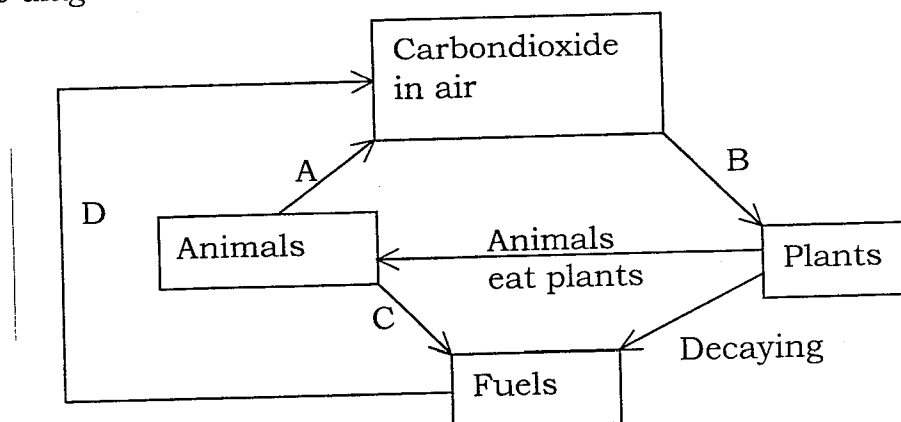
6. (a) Copy and complete the table below which is about electrolysis of 2 electrolytes.

Electrolyte	Product at Anode	Product at cathode
Dilute $\text{H}_2\text{SO}_4$		
$\text{CuSO}_4$ solution using Copper electrodes		

(2marks)

(b) For both electrolytes in the above table, write Ionic equations to show the reactions taking place at the Cathode. (2marks)

7. The diagram below shows Carbon cycle



(a) Name the processes A, B, C and D. (2marks)

(b) What does the word fuel mean? (1mark)

(c) Give one example of a fuel that is used in your home. (½mark)

8. (a) What do you understand by the word catalyst? (2marks)

(b) Give the name of the catalysts used in the following reactions: (½mark)

(i) Decomposition of Hydrogen peroxide ( $\text{H}_2\text{O}_2$ ). (½mark)

(ii) Reaction between Zinc (Zn) and dilute Sulphuric acid ( $\text{H}_2\text{SO}_4$ ). (½mark)

(iii) Contact process. (½mark)

9. A Hydrocarbon contains 82.8% by mass of Carbon and the rest is Hydrogen.

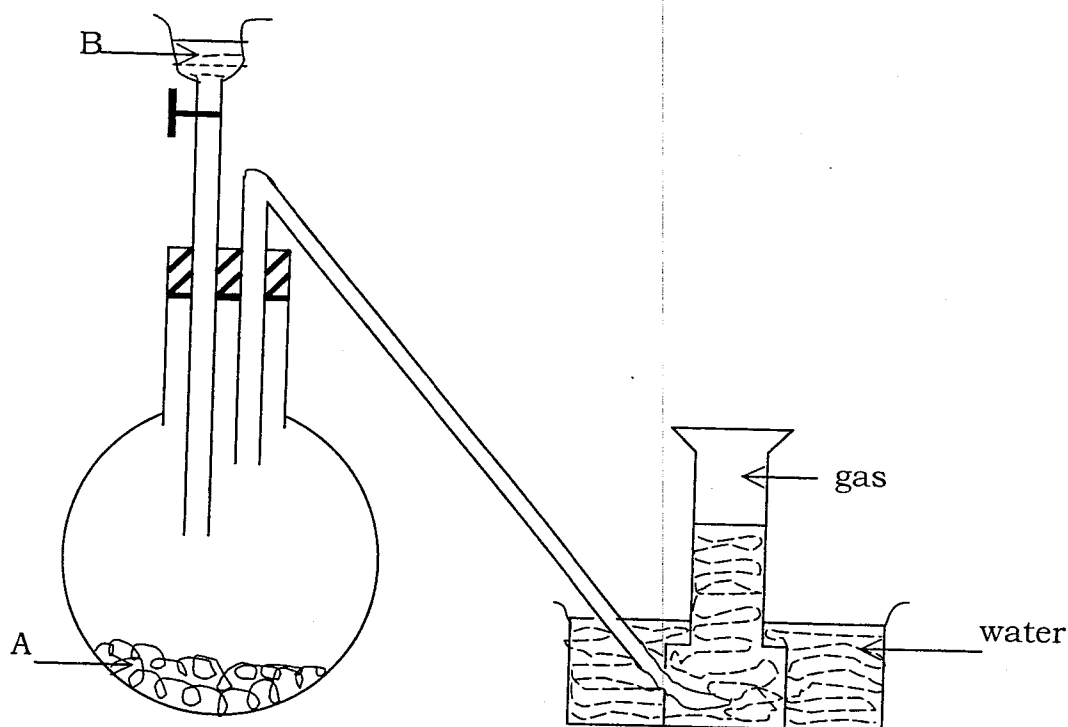
(a) Calculate the empirical formula of the hydrocarbon.

(2marks)

(b) If the relative molecular mass of the Hydrocarbon is 58, calculate its molecular formula. (Relative atomic masses are: C = 12, H = 1)

(2marks)

10. The apparatus below is used to prepare only one of the two gases mentioned below.  
Hydrogen, Ammonia.



(a) Which of the mentioned gases can be prepared in the laboratory using the apparatus (diagram) shown?

(1mark)

(b) State the names of the substances A and B indicated in the diagram.

(2marks)

(c) Give a reason why the other gas can not be prepared using the apparatus shown.

(1mark)

11. When most nitrates are heated, **one** or **two** gases may be given off from the nitrates of the metals Potassium, Zinc, Sodium, Copper.

(a) Choose two nitrates that give off 2 gases on heating.

(2marks)

(b) Choose one nitrate that gives off one gas on heating and write a balanced equation for the reaction.

(1mark)

12. The table below shows part of the periodic table. Use it to answer the following questions.

H						He
			C	N	O	
Na						Cl
K						Br

- (a) Which of the elements Na and K is more reactive? **(1mark)**
- (b) Which of the elements Cl and Br is more reactive? **(1mark)**
- (c) Select one element that will form Ionic bond (electrovalent bond) with O. **(1mark)**
- (d) Write the electronic configuration of K. **(1mark)**

13. Name the following organic substances.

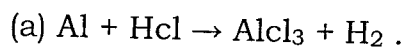


14. Complete the following table

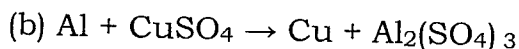
Experiment	Observation	Inference (Conclusion)
(a) Add NaOH solution to solution X	A blue precipitate	
(b) Add NaOH solution to solution Y		Solution Y contains $\text{Fe}^{2+}$
(c) Add NaOH solution to solution Z	A white precipitate that Dissolves in excess NaOH	
(d) Add $\text{H}_2\text{SO}_4$ solution to solution W		Solution W contains $\text{CO}_3^{2-}$

**(4marks)**

15. Balance the following equations



(2marks)



(2marks)

**SECTION B: Chose THREE questions from this section.**

16. (a) State **one** anion that causes permanent hardness of water and **one** anion that causes temporary hardness of water.

(2marks)

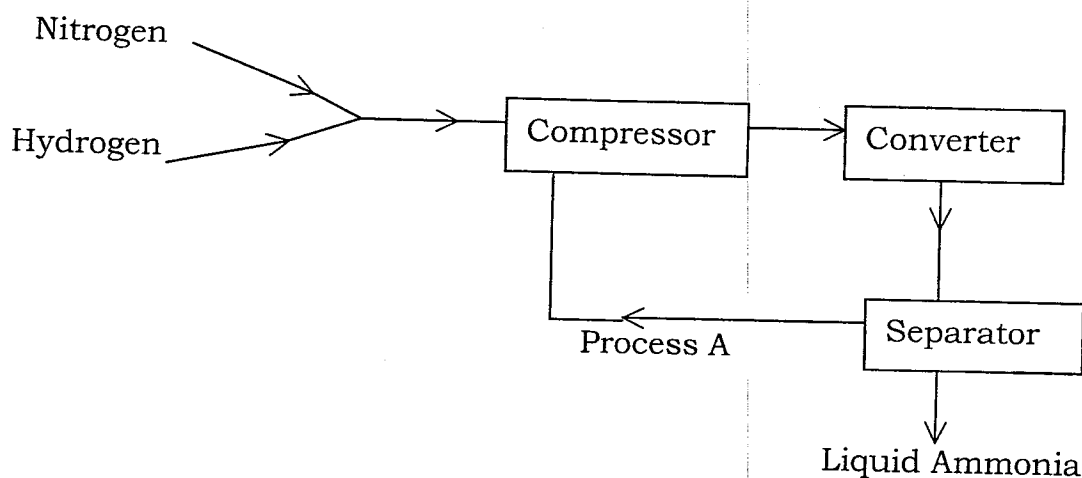
(b) State a simple chemical test that can be carried out to distinguish the anion in temporary hard water from the anion in permanent hard water. You must clearly state the observations that would be made.

(2marks)

(c) With the help of balanced equations, state the observations made when Carbon dioxide is bubbled into lime water for a long time and the solution is then boiled.

(6marks)

17. Study the simplified flow diagram below and answer the questions that follow.



(a) Name the source of Nitrogen and Hydrogen.

(2marks)

(b) The reaction takes place in the converter under certain conditions of temperature and pressure in presence of a catalyst.

(i) What is the name of the catalyst used?

(1mark)

(ii) State the optimum temperatures and pressure used in the converter.

(2marks)

(iii) Name process A and give a reason why it is important.

(2marks)



**SECTION C:**

21. If you are only given distilled water, (H<sub>2</sub>O) dilute hydrochloric acid (HCl), solid Sodium Carbonate (Na<sub>2</sub>CO<sub>3</sub>), Zinc metal (Zn) and Magnesium Sulphate solid (MgSO<sub>4</sub>)

N.B: The order of reactivity series is Sodium, Magnesium, Zinc and Hydrogen.

By use of equations, outline how you would prepare pure samples of:

- (a) Zinc Carbonate.
- (b) Magnesium chloride.

**(7½marks)**

**(7½marks)**

22. Read the following passage and answer the questions that follow.

To a black powder A was added dilute H<sub>2</sub>SO<sub>4</sub> and a blue solution B was formed. When NaOH solution was added to B, a blue precipitate C was formed. When C was strongly heated the black powder A was formed. When Na<sub>2</sub>CO<sub>3</sub> solution was added to B a green-blue precipitate D was formed. When D was strongly heated, the black powder A was formed.

(a) Name and write the formulae of substances A, B, C and D.

**(8marks)**

(b) Write balanced equations for the reactions mentioned in the passage.

**(7marks)**

23. (a) With the aid of a well labelled diagram, describe an experiment to prepare chlorine gas from Manganese IV oxide (MnO<sub>2</sub>).

**(9marks)**

(b) Write equations to show how Cl<sub>2</sub> reacts with:

- (i) Iron (Fe)
- (ii) Iron II chloride (FeCl<sub>2</sub>)
- (iii) H<sub>2</sub>O
- (iv) NaOH

**(4marks)**

(c) State two uses of Chlorine.

**(2marks)**