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**CHEMISTRY**

**PAPER 2 (THEORY)**

**JULY/AUGUST 2009**

**TIME:2 HRS**

## **NANDI EAST DISTRICT JOINT EVALUATION TEST 2009**

**Kenya Certificate of secondary Education**

**Chemistry**

**Paper 2**

**Time 2 hrs**

1. The grid below represents part of the periodic table. Study it and answer the questions that follow. The letters are not actual symbols of the elements

A									
	B			C		D	F	E	
V	W							X	

- (a) Select the element that can form an ion with a charge of -2. Give a reason  
( 1 mark)
- (b) What type of structure could the oxide of C have? Explain  
( 2 marks)
- (c) How does the reactivity of X compare with that of E? Explain  
( 1 mark)
- (d) Compare the ionization energies of A and V  
( 2 marks)

(e) 1.2 g of B reacts completely when heated with 1.11 dm<sup>3</sup> of chlorine gas at s.t.p ( 1 mole of a gas at s.t.p occupies 22.4 dm<sup>3</sup>)

(i) Write a balanced equation for the reaction between B and chlorine gas ( 1 mark)

(ii) Determine the relative atomic mass of B ( 1 mark)

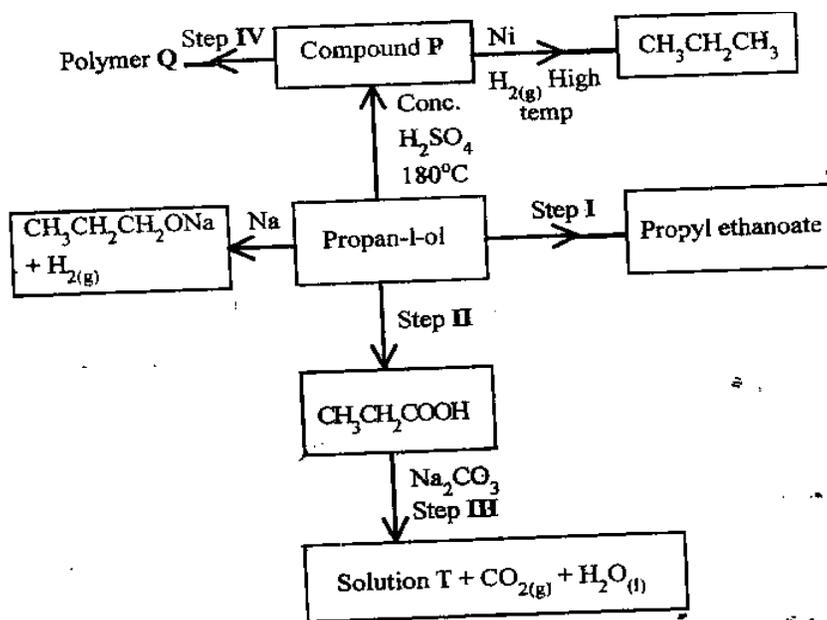
(f) Explain how you would expect the following to compare ( 2 marks)

(i) Atomic radius of V and W. Explain

( 2 marks)

(ii) The pH values of aqueous solution of oxides B and W. Explain (2marks)

2. Study the scheme below and answer the questions that follow



(a) Name the compound P:

( 1 mark)

(b) Give one industrial source of P

( 1 mark)

(c) Draw and name the structural formula of the third member of the homologous series to which P belongs ( 2 marks)

(d) Name the types of reaction taking place in

(i) Step III ( 1 mark)

(ii) Step IV ( 1 mark)

(e) Draw the structural formula of Q using repeating unit in polymer Q whose molar mass is 3150 (H = 1, C = 12) ( 2 marks)

(f) Write the chemical of the compound produced in step 1 ( 1 mark)

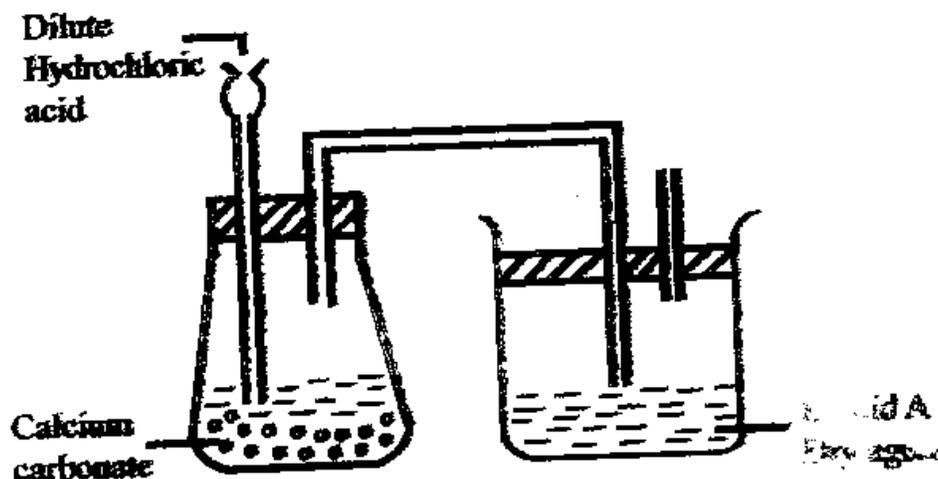
(g)  $R - COO^-Na^+$  and  $RCH_2OSO_3^-Na^+$  represent two types of cleansing agents

(i) Name the class of cleansing agent to which  $R - COO^-Na^+$  belongs

(ii) Which of the two cleansing agents would be suitable to use when washing with rain run-off draining from that lime has been used. Give a reason for your answer

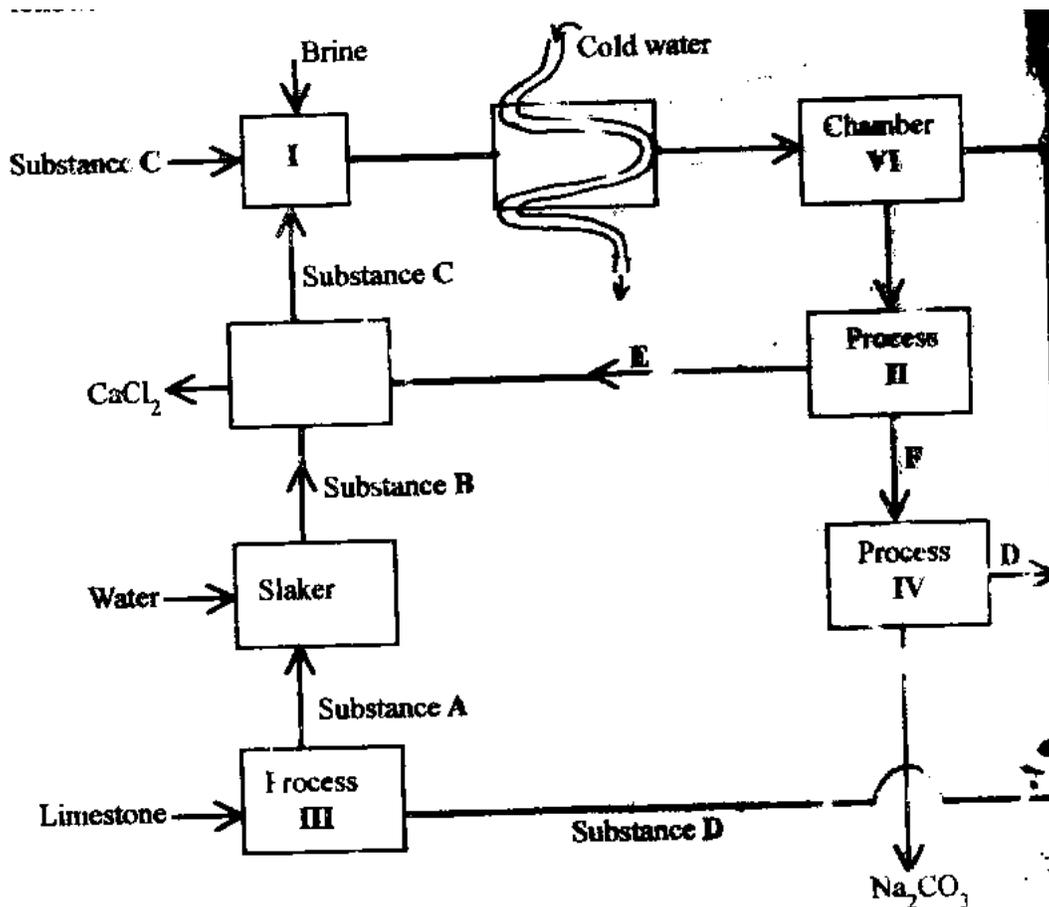
( 2 marks)

3. (a) The diagram below represents an incomplete set-up of apparatus that can be used to prepare and collect dry carbon (IV) oxide gas. Complete the diagram and answer the questions that follow.



- (i) Write the equations for the reaction that takes place ( 1 mark)
- (ii) Name liquid A: (1 mark)
- (iii) Calcium carbonate was replaced with lead carbonate but the volume of the gas collected was very small. Explain ( 1 mark)
- (iv) Explain why calcium hydroxide is used to detect the presence of carbon (IV) oxide while potassium hydroxide cannot be used ( 1 mark)

(b) The flow chart below shows the solvay process. Study it carefully and answer the questions that follow



(a) Name the following substances:

(i) E:

( 1 mark)

(ii) B:

( 1 mark)

(b) Give a reason why cold water is passed over the solvay tower

( ½ mark)

(c) Write a balanced equation taking place in chamber

( 1 mark)

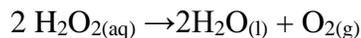
(d) State one other use of sodium Carbonate apart from manufacture of glass

( 1 mark)

(e) State one substance that can be recycled in the solvay process ( ½ mark)

4. (a) Give any two measurements that can be used to investigate the rate of a reaction  
( 2 marks)

(b)\_ An aqueous solution of hydrogen peroxide decomposes according to the equation  
( 2 marks)



This reaction is fast at 20<sup>0</sup> C in the presence of powdered manganese (IV) oxide catalyst. Sketch graphs showing how volume of oxygen (vertical axis) varies with time ( horizontal axis) when:

(i) 0.5 of catalyst is mixed with 100cm<sup>3</sup> of 0.2 M hydrogen peroxide solution. Label the curve A  
( 1 mark)

(ii) The same experiment is repeated at 30<sup>0</sup>C. Label it B ( 1 mark)

(c) (i) What is the effect on the catalyst in the above reaction? ( 1 mark)

(ii) A 0.8 g lump of manganese (IV) oxide was used in a similar reaction in (b) above instead of the fine black powder. What effect does this reaction have in the reaction. Explain  
( 2 marks)

(d) An experiment was performed to illustrate Le – Chatelliers principle. In the experiment acidified potassium dichromate was used and the equation below shows the reaction at equilibrium



(a)state Le Chattelliers Principle ( 1 mark)

(b) State and explain the observation made on the equilibrium when potassium hydroxide solution is added ( 2 marks)

(c) State the effect on the system when pressure is increased ( 1 mark)

(d) What is dynamic equilibrium ( 1 mark)

5. I study the standard electrode potential of the following element and answer the question that follow

Reaction	$E^0$ (volts)
$R^+_{(aq)} + e^- \longrightarrow R_{(s)}$	-2.92
$S^{2+}_{(aq)} + 2e^- \longrightarrow S_{(s)}$	-0.76
$2T^+_{(aq)} + 2e^- \longrightarrow T2_{(g)}$	0.00
$Q^+_{(aq)} + e^- \longrightarrow Q_{(s)}$	+0.80
$V^+_{(aq)} + e^- \longrightarrow V_{(s)}$	+1.10

(a) Using the electrode potentials of elements S and Q

- Write the ionic equation for the cell made by combining the two half cells
- Calculate the e.m.f of the cell formed in part (i) above ( 1 mark)

(b) Identify the strongest reducing agent (1 mark)

(c) Identify and write the cell diagram for two elements that would produce the highest e.m.f ( 2 marks)

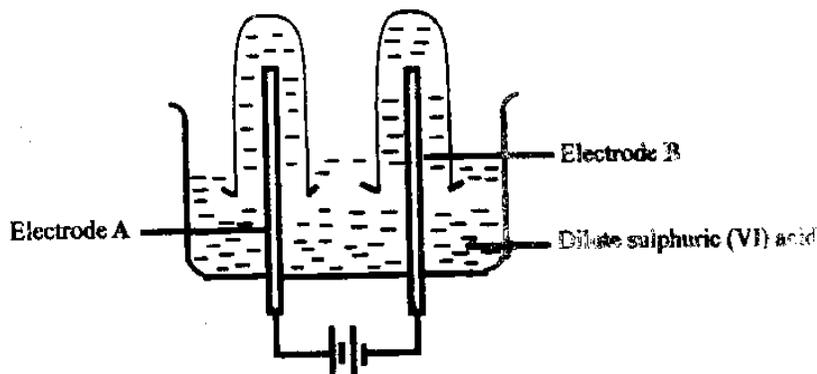
(d) (i) Lead acid accumulators has the lead plate as the negative electrode and lead (IV) oxide as the positive terminal. Write the two half equations taking place when the lead acid accumulator is in use

Anode ( 1 mark)

Cathode ( 1 mark)

(ii) Lead acid accumulator is said to be most effective cell since it can be recharged, During recharging, the original reactants are restored. Write the overall equation showing the recharging reaction ( 1 mark)

II. The diagram below shows a set -up of electrolysis of dilute sulphuric (VI) acid. Use it to answer the questions that follow

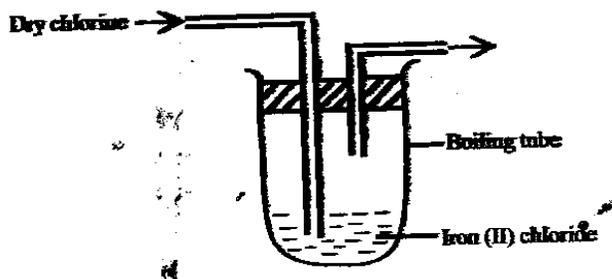


(a) Identify the substances produced at the cathode and anode ( 1 mark)

(b) What is the quantitative ratios of their volumes ( 1 mark)

(c) Calculate the volume of the gas produced at the electrode B if a current of 1.50 amperes is passed through the electrolysis for 30 minutes. (molar gas volume at s.t.p= 22.4dm<sup>3</sup>, 1 Faraday = 96,500C) ( 2 marks)

6. (a) Dry chlorine gas is bubbled through a solution of iron (II) chloride as shown below



(i) What observations is made in the boiling tube? explain ( 2 marks)

(ii) Write the ionic equation for the reaction that took place in the boiling tube  
( 1 mark)

(b) Name the products formed when chlorine reacts with  
(i) Phosphorous ( ½ mark)

(ii) Ammonia gas ( ½ mark)

(c) Chlorine is preferred as a bleaching agent compared to sulphur (IV) oxide. Explain  
( 2 marks)

(d) Hydrochloric acid reacts with silver nitrate to form a white precipitate which dissolve in ammonia solution to form a complex ion

(i) Identify the complex ion ( 1 mark)

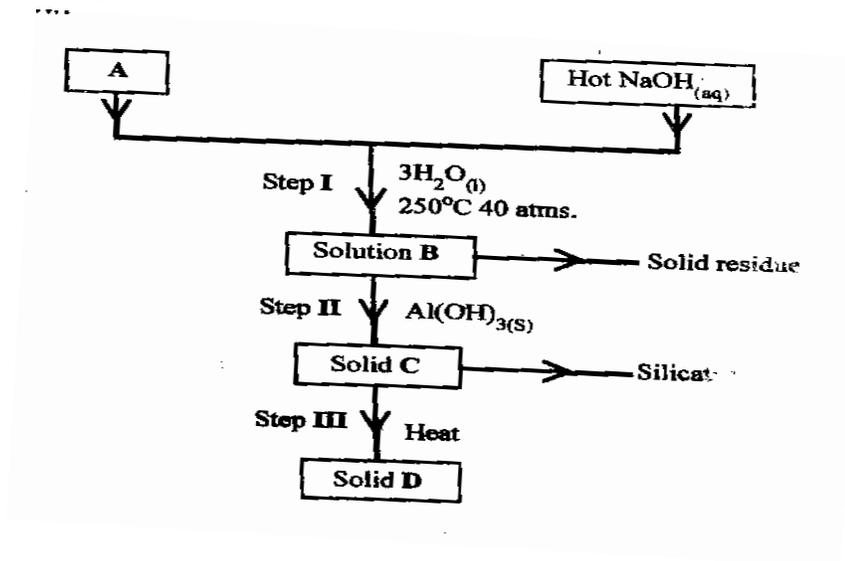
(ii) Write the equation for the formation of the complex ion ( 1 mark)

(e) (i) In the manufacture of hydrochloric acid the gases are dissolved in water over glass beads  
What is the function of glass beads?

(ii) Give one industrial use of hydrochloric acid ( 1 mark)

7. (a) During extraction of aluminium, the oxide of the metal is dissolved in molten cryolite before it is electrolyzed. Explain ( 1 mark)

(b) The reaction scheme below shows how aluminum is extracted. Study it and answer the questions that follow.



(i) Identify compounds

A:

B

C

D

( 2 marks)

(ii) What name is given to process in step II?

( 1 mark)

(iii) Why is it necessary to carry out the process in (ii) above

( 1 mark)

(c) During electrolysis of the molten mixture of cryolite and aluminium oxide, the anode should be replaced regularly. Explain ( 2 marks)

(d) During one such process a current of 40,000 amperes is passed for one hour.

Calculate the mass ( in kilograms) of aluminium produced. (A1 = 27, 1 Faraday = 96,500 coulombs ( 2 marks)

