

Candidate's Name.....

Signature.....

P525/3
CHEMISTRY
Paper 3
(Practical)
Oct/Nov
3 ½ hours

UGANDA NATIONAL EXAMINATIONS
 UGANDA ADVANCED CERTIFICATE OF EDUCATION
 CHEMISTRY
 PAPER 3
 (Practical)
 3 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

This paper consists of **three** examination items.

All items are **compulsory**. Use blue/black ink. Any work done in pencil will **not** be marked except for drawings.

Write your answers in the spaces provided. **No** additional sheets of paper should be inserted in this booklet.

Mathematical tables and silent non-programmable calculators may be used

Reference textbooks (i.e. textbooks, booklets on qualitative analysis etc.) should not be used.

You are not allowed to start working with the apparatus for the first 15 minutes. This time is to enable you to read the question paper and make sure you have all the apparatus and chemicals that you require

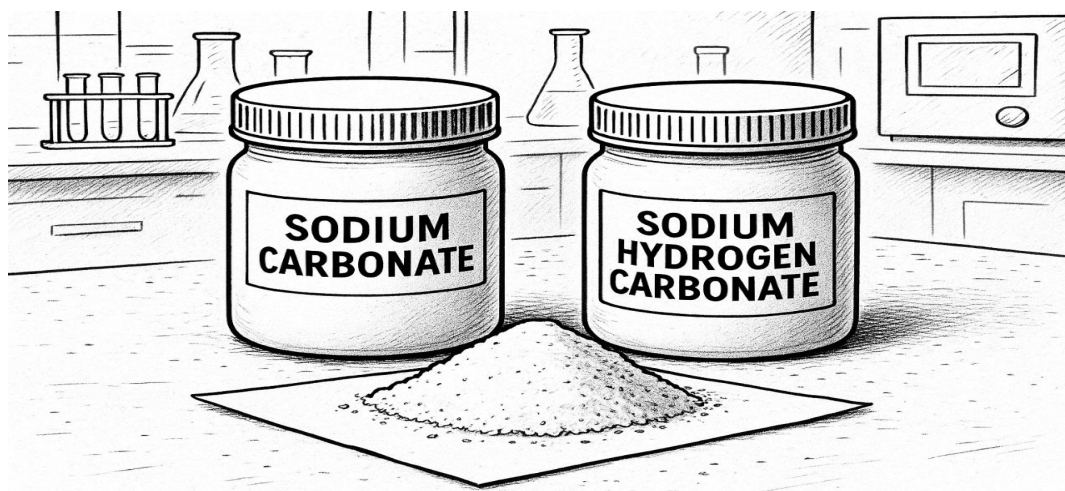
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Item 1	Item 2	Item 3	Total

Item one.

Annet, is a laboratory cleaner at Smutes High school. Yesterday, as she was mopping the shelves, she accidentally knocked over tins of chemicals. Two of the tins were loosely covered and the chemicals spilt on a piece of paper lying on the ground. The labels on the tins read **Sodium carbonate (Na_2CO_3)** and **sodium hydrogen carbonate (NaHCO_3)**.

She wanted to discard the chemicals but the lab attendant urged that the chemicals can still be useful if **the proportions in which the chemicals mixed are known**.

Being Annet's closest friend who offers A level chemistry, she comes to you for help.

**Hint from the lab attendant.**

Such a mixture of compounds can react with an acid to produce salts. When two different indicators are used, the amount of acid that reacts with each compound can be determined and then used to calculate the amount of each chemical present in the mixture.

The lab attendant offered to provide for you the following solutions

FA1 which is 0.15M hydrochloric acid

FA2 which is a solution made from the spilled chemicals

He however, expects a report of your activities in the lab

Tasks.

- i) Design an experiment that you can use to solve this dilemma
- ii) Perform the experiment and record your results
- iii) From your results, determine the proportions in which the chemicals spilled.

ITEM 2: A CASE STUDY.

Chemical poisoning in communities is a serious issue affecting health, water safety and the environment. In Uganda, poor waste disposal from industries and households can lead to contamination of water sources, food substances and breathable air.

In 2023, residents of Kasubi, a suburb of Kampala reported health problems such as skin irritations, cough, stomach pain and constipation. Investigations linked these problems to contamination of water sources and food substances sold within Kasubi Market. Residents reported issues such as bitter taste and unusual color in drinking water and dead fish in the nearby stream. Samples were collected from the water and food substances but the causative agents could not be identified.

Recently there has been a surge in death of middle-aged residents around 35-45 years. Post mortem analysis of some of the dead residents revealed an idiopathic (unknown) cause. However, a common chemical component was found highly concentrated in their blood and liver.

Pathology Lab personnels managed to isolate it and it closely resembles some known chemicals which contains **two cations** and **two anions** but its identity remains unknown. they have forwarded it to the chemistry lab for confirmation.

You, an intern serving in Mulago Chemical Analytics Lab, are selected to solve this mystery.

You are provided with the sample labeled **M** and a set of instructions to follow in order to identify the chemical substances present in the sample. You are advised to record your observations and deductions. Identify any gas(es) evolved

Aim.....
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Hypothesis.....
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Variables.....
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Tests	Observations	Deductions.
Appearance of M		
Heat a spatula endful of M in a dry hard test tube		

Dissolve a spatula endful of M in 5cm ³ of distilled water. Shake well and filter. Keep both the filtrate and the residue		
Divide the filtrate into 6 parts. To the first part, add sodium hydroxide solution dropwise until in excess.		
To the second part, add drops of potassium iodide solution		
To the third part, add ammonia solution dropwise until in excess.		
Use the fourth part to carry out a test of your own to confirm the first cation in M		
To the fifth part, add lead(ii) nitrate solution and warm		
To the sixth part, add silver nitrate solution followed by excess ammonia solution		
Wash the residue and dissolve it in dilute nitric acid. Divide the resultant solution into 5 parts.		
To the first part, add sodium hydroxide dropwise until in excess		
To the second part add ammonia solution dropwise until in excess		
To the third part add drops of potassium hexacyanoferrate (ii) solution.		

Use the fourth part to carry out a test of your own to confirm the second cation in M		
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Analysis

conclusion.....

Item three.

Solomon is an athlete who competes in various marathons around the world. After a run, Solomon started experiencing dizziness, stomach discomfort, diarrhea and vomiting. The doctors who checked him attributed these symptoms to chemical poisoning. They suspected that he that the chemicals were put in the water that Solomon took during the race. In order to treat him properly, they need to know the identity of the chemical causing the symptoms in order to administer the appropriate antidote.

A sample of the poisoned water labeled **D** was taken to the chemical analytics lab for identification. However, the Lab personnel was out on a break. You were the only chemist around who could aid the doctors.

On the shelves is a list of instructions to aid in the identification of chemical compounds in poisons.

Task.

Using a sample of the poisoned water labeled **D**, and the list of instructions provided below, carry out tests to identify the nature of the chemical component in D. record your observations and conclusions.

Aim.....
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Hypothesis.....
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Variables.....
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Tests	Observations	Deductions
Burn a small amount of D on a spatula endful		

Dissolve 3cm ³ of D in 5cm ³ of water. Test with litmus paper. Divide the resultant solution into 8 parts		
To the 1 st part add a spatula endful of solid sodium carbonate		
To the 2 nd part, add 3 drops of neutral iron(iii) chloride solution		
To the 3 rd part, add 3 drops of Brady's reagent.		
To the 4 th part add solid sodium metal		
To the 5 th part, add acidified potassium permanganate solution and heat.		
To the 6 th part, add an equal volume of ethanoic acid, followed by 3 drops of concentrated sulphuric acid and warm the mixture.		
To the 7 th part, add Luca's reagent		
To the 8 th part, add 2cm ³ of iodine solution. Shake to mix. Add dilute sodium hydroxide dropwise until the brown colour disappears then warm		

from your results, comment on the nature of the chemical substance in D.

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The End

Advance information.

In addition to other materials commonly found in a chemistry laboratory, each student must be provided with the following.

50cm³ burette

20/25cm³ pipette

2 conical flasks

2 beakers

8 test tubes

1 spatula

Filter paper

250cm³ of FA1

250cm³ of FA2

8g of M

5cm³ of D

FA1 is 0.15M hydrochloric acid

FA2 is a solution prepared by dissolving 5g of anhydrous sodium hydrogen carbonate and 15g of anhydrous sodium carbonate in 1 liter of water

Solid M is a mixture of zinc chloride and copper (ii) carbonate in the ratio of 2:1

Substance D is propan-2-ol