

ASSOCIATION OF GREATER LUWERO BIOLOGY/CHEMISTRY EDUCATORS

UGANDA CERTIFICATE OF EDUCATION CHEMISTRY SEMINAR

HELD AT : SHAMMAH HIGH SCHOOL - LUWERO

DATE: SATURDAY 27th JUNE, 2026

FOREWORD TO STUDENTS AND TEACHERS

On behalf of Greater Luwero Bio/Chem Educators, we bring you greetings and Good news from our team; Greater Luwero is your companion to achieving excellent results. This seminar has been organized for you to interact with the most celebrated and knowledgeable facilitators of Chemistry. Their role is to guide you in the question approach and also equally to caution you about the mistakes that you make in the final examination which cost you excellent grades. Nothing is more difficult and more precious than making the right decision, Kindly students, and always spare time to select questions where you can get maximum scores. Always do a comparison of the items before responding.

ALL FROM YOUR FRIENDS OF CHEMISTRY

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CHEMISTRY PAPER I (P525/1)

SEMINAR ITEMS

SECTION A

2ND ELEMENT OF CONTRUCT ITEMS:

Appreciates the application of chemistry in daily life

ITEM 1(a). DRUGS AND MEDICINE

After Kiprop completed the race in a cross country marathon, he felt some pain in his muscles which prompted him to ask for permission to meet the herbalist help. His sports manager refused and instead instructed him to go to the team Doctor. The team doctor diagnosed Kiprop with a bacterial infection and gave him aspirin and penicillin tablets. Having taken some rest for a few days, Paul felt r and this left him wondering. He has approached you for some help.

Task

As a Chemistry learner, write a message you will share with him to explain;

- The categories of the products Kiprop was given.
- Explain to Paul why long-term use of the products is bad.
- Compare the products from team doctor's clinic with those from the herb he wanted to visit.

ITEM 1(b) (Drugs and medicines)

On one Monday evening, Mr. Adam was feeling some joint pains and body weakness. When he went for analysis, it was found that he was infected with malaria. The cost of the drugs was too high and he decided to return home and take some paracetamol which he had got recently for his daughter. For the meantime, he felt some relief but after two hours of resting, he realized that the pain was just increasing and he has contacted you for some assistance and guidance.

Task:

As a chemistry learner, help Mr. Adam to;

- Point out the problem Mr. Jull made when choosing the product
- Guide Mr. Juli on how the right product works
- Advise him on the challenges associated with long term use of the right product
- Help Mr. Juli evaluate the products

ITEM 2 (Soapy and soapless detergents)

Communities around lake Kyoga have reported increasing algae growth and fish deaths linked to household detergents that they use. Local district officials have asked residents to switch to safer alternatives, but many families do not know which product to choose or *why* it matters.

You have been consulted as a chemistry learner to explain this issue.

Task;

- Name the category of the alternative detergent and describe how it works
- Describe one side effect to life associated with long term use of the alternative detergent
- State the similarities and differences of the named alternative detergent and the one causing the problem to the community.

ITEM 3 (Food additives)

Vegetables such as tomatoes, carrots and beetroot are used in the preparation of sauces and smoothies because they contain important citamins that strengthen

the body and improve health. The Home Economics Club of a certain secondary school prepares vegetable source which they sell to teachers and residents. However, they have realized that sales reduce during the rainy season, and when the sauce is kept for several days, it develops a sour taste and an unpleasant smell. They have tried to use lemon extract, but the problem still persists. They have now been advised to add potassium carbonate, but the club chairperson is worried about its side effects, and other members want to know how this preservative differs from the natural one they have been using. Your friend has referred the chairperson to you as a knowledgeable student for guidance.

Task: As a learner of chemistry;

- Identify the category of the alternative product.
- State the function of the alternative products
- Explain the challenge associated with continuous use of the alternative product.
- Guide the club members to make an evaluation of the alternative product and the one they have been using.

ITEM 4 (Nuclear processes)

Kalongwe Uranium mine uses the radioactive substance to obtain energy they use to generate electricity that powers the region. However, the citizens are concerned about radioactive waste management in a temporary facility which could pose environmental contamination. Alternatively, some scientists advised that, another process of formation of tritium from protium and deuterium which also produce energy can be employed but occurs at high temperature and pressure making it not viable.

The plant management has collected data on the count rate per minute of the radioactive waste ^{238}U at a period of 24 hours in order to determine the half-life of the waste and ensure safe storage and disposal. The data collected is presented in the table below

Time (hours)	0	4	8	12	16	20	24
Count rate	800	355	157	69	31	14	6

Task

As a chemistry learner,

- Identify the nuclear reaction employed at Kalangwe Uranium mine to generate electricity.
- Explain any other use of the form of energy used in the mine to generate electricity.
- Plot a graph of count rate against time and use it to determine the half-life of the radioactive substance.
- Explain any danger associated with the form energy used in the mine to generate electricity.
- Compare the process used to produce energy in this plant and the alternative process.

4. (b) NUCLEAR PROCESSES

A new factory in Nakasongola district uses fuel obtained from splitting of radioactive substances as their alternative to Hydro Electric Power. Many employees have succumbed to cancer. The production manager is worried. The district spokesperson is interested in the matter and has scheduled a meeting with the company administration. The manager has contacted you for guidance prior to the meeting

Task: As a learner of chemistry,

- (a) Identify the process undergone by radioactive substances
- b) Explain how electricity can be produced by that process stated in (a).
- c)** Explain the risks associated with the long-term use of the process and state what should be done to overcome such.
- d)** How effective is the process

ITEM 5 (a) (beverages)

After several hours of jogging during early morning, James and Hadijah were feeling very thirsty. They decided to go to nearby supermarket to buy some of the commonly used products in our daily life as shown in figures 1 (Fruit juice) and figure 2 (bottled soda). After drinking the products, they felt relieved from thirst. However, they are both worried about health dangers associated with the long term use of the products.



Fig 1



Fig 2

Task:

As a chemistry student;

- a. Point out the categories of the products bought by James and Hadijah.
- b. Explain to both of them how the products work after drinking them.
- c. Advise them about the danger associated with one of the product.
- d. Compare the products bought by James and Hadijah.

ITEM 5 (b) (BEVERAGES)

Mr. Opoka on attending a graduation ceremony that was organised Omara, he saw a popular industrial beverage known as **GIN** among the being served. He became curious and requested to be served with the although he had less knowledge about it. After taking it, he got drunk.

Task

As a chemistry learner,

- a) Identify the category of the product.
- b) State the other function of the substance in the product
- c) Explain why excessive consumption of the beverage is bad
- d) Compare the industrial product with the one that is locally prepared.

3RD ELEMENT OF CONSTRUCT ITEMS:

Appreciates the diversity and interaction of substances and their importance in everyday life,

ITEM 6

Many farmers in Nderje village use ropes to graze their goats in fields. Mr. Kekule a reknowned trader in the area is planning to open up a stall that sell all sort of ropes without affecting environment. He wants to make good and strong ropes for his clients. Nylon and sisal are some of the different material proposed to him. However, Kekule knows that choosing quality ropes depends un nature of the materials used.

Task;

As a learner of chemistry;

Write down what would be your contribution on,

- a). categories of the material proposed to him
- b). Suitability of the material.
- c). Suggest one other Use of the material
- d). Explain the dangers associated with the product on the environment.

ITEM 7

Mr. Babu a renowned farmer in one of the regions in Uganda faces a challenge of a bad odour from plant and animals wastes from his farm. The smell is all over the farm, He was once told that such wastes can be used to produce a useful fuel product that can serve different purposes on the farm.

Task;

As a learner of chemistry, Help Mr. Babu to,

- a). Identify the fuel product and its category that can be obtained from the wastes on his farm.
- b). The properties of the fuel product
- c). Explain one use of the product
- d). Explain the impact of the product to the environment and how to overcome such.

ITEM 8

Residents in Kigoogwa sub county mainly depend on borehole as their only water source. Recently, there is art increase in the electricity bills among the homestead in the region. This is due to scale formed on their kettles and boilers as a result of continuous use of hard water. They have been advised by the community development officer to use vinegar (that mainly consists of a compound called ethanoic acid) to clean off the scale.

Some of the residents are interested in nature, composition and structure of this compound and if possible, any impact it may have to the environment.

One of your classmates is a resident and has come for guidance from you.

Task:

Using the knowledge attained in chemistry class;

- a) Categorize the homologous series of the compound in the substance they have been told to use.
- b) Explain the properties of the compound.
- c) Suggest any other use or Ins component in dally ote.
- d) Present one likely impact of this component to the environment and how to overcome such.

ITPM 9

In a certain village in Uganda, the Ministry of Works and Transport has contracted a local construction company to build a steel bridge across a river to replace an old wooden bridge that has become weak and unsafe.

One of the community members has approached you for clarification, knowing that you study chemistry.

Task

As a learner of chemistry, help the community to:

- a) Categorize the substance to be used in constructing the bridge.
- b) Explain the properties of the substance and state one other use apart from bridge construction.
- c) Explain one environmental impact associated with the use of the substance and mitigation measure.

ITEM 10

Joan uses charcoal as her main fuel for cooking. She often cooks outside her veranda. One day, she decided to do cooking inside her closed single room, and after few hours, she suffocated and collapsed. She was rescued by her neighbors and taken to a nearby health unit.

One of the neighbors is inquisitive on the type of combustion that made Joan to collapse.

Task:

As a chemistry learner;

- a) Explain the types of combustions encountered by Joan and the products evolved in each case.
- b) Suggest the properties of one of products in the above types of combustion
- c) Suggest one use of the product identified in (b) above.
- d) Explain the impact of the identified product in (c) to the environment.

ITEM 11

A factory dealing in dyeing and printing of fabrics often uses hydrated salts to improve the adhesion ability of the dyes. The production manager has revealed that suitable compounds for the formulation is one with a higher percentage of water of crystallization.

Two compounds, magnesium sulphate dodecahydrate ($\text{MgSO}_4 \cdot 12\text{H}_2\text{O}$) and sodium carbonate decahydrate ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$) have been identified for the formulation. The management is seeking for a better choice for the effective formulation. However, nature, structure and compound should be known before using it. Take them through. During a community meeting, some residents expressed concern about the use of steel, as they were unsure about its nature, use and possible effects on the environment.

Task:

Basing on the chemistry content you gained in S.3

- a). Categories the compounds identified for the formulation
- b). Advise them on the choice of the ideal compound for the formulation.
(Mg=24, S=32, O=16, H=1, Na = 23, C = 12)
- c). Suggest one other use of the identified compound in (b) above.
- d). Write down one impact of having a lot of this compound in the environment and how it can be mitigated.

ITEM 12

A water purification plant uses electrolysis to produce oxygen gas for purifying contaminated water in some remote village in Kayunga district. The plant uses dilute Sulphuric acid as the electrolyte in an electrolytic cell fitted with platinum electrodes. When current is passed through, bubbles of gases are evolved at each electrode. This left some workers from other departments surprised. Some wanted to know the nature, structure and composition of these gases evolved. The team is interested in determining the number of particles of the gas evolved at the anode if a total volume of the gas is 44.8cm^3 were collected at stp. You have been contacted for help. Where necessary; (1 mole of a gas occupies 22.4dm^3 at stp; 1mole contains 6.02×10^{23} particles.

Task:

Using the knowledge you have obtained from chemistry class;

- Categorize the products evolved at the electrodes.
- Suggest properties of the gas evolved at the anode.
- Determine the number of particles of the gas evolved at anode
- Present any one impact of the gas evolved at the cathode to the environmental and what should be done to overcome such.

ITEM 13

Senior four students of Kaliisa secondary school were investigating about two physical properties of certain elements of the periodic table.

They first divided the obtained mass of each element to the volume it was occupying so as to obtain the subsequent density values.

Since the elements being investigated are soft, they decided to obtain their Mohs hardness values by researching from available data on the internet.

The overall data obtained by the students was as shown in the table 1 below.

Table1.

Element	Density (gcm ⁻³)	Metal hardness
Li	0.53	0.6
Na	0.97	0.5
K	0.86	0.4

However, the students would like to understand why the elements have varying density and Metal hardness values plus their environment impact. They have approached you for help.

Task:

Use your chemistry knowledge to;

- Explain the category of the elements being investigated by the students
- Explain to the students, the trend(s) of the two physical properties they were investigating.
- Advise the students about the environment impacts of the elements.

ITEM 14

A group of learners were faced with a unique solid substance, W, which they suspected to be an element.

0.3 g of the element could burn in oxygen to form 0.5 g of the solid. One of them picked interest in what could be the chemical formula of the oxide of the element. However, he did not know how to determine the formula neither its daily use.

When they contacted the laboratory technician he gave them the atomic number and mass number of W, as 12 and 24 respectively, and the symbolic representation of oxygen as $^{16}_8\text{O}$. Further still, he wanted to know the structure, nature of W and its impact to the environment. Take them through.

Task:

As a student of chemistry help the learner to,

- Understand the nature of substance W,
- Determine the formula of the oxide of W.
- Describe how the W and oxygen form a compound.
- Suggest properties of the oxide formed.
- Explain the environmental consequence of the oxide formed and their mitigations.

ITEM 15

In an attempt to find an alternative fuel for cooking, some industrial workers came up with a new substance Q which on further analysis, was found to be Cantaininn 79.9% carbon whila the remaining percentage being hydrogen, its molecular mass is Tha workers are confused about how to determine the molecular formula of substance Q. The environmentalists have cautioned the industrial workers not to continuous IY burn substance Q citing that its combustion could potentially lead to deterioration of environment quality.

Task:

As a chemistry learner

- Explain the category of substance Q
- Give the properties of substance Q that make it useful our everyday life,
- Help the industry workers to determine the molecular formula in of substance Q
- Explain the impact of substance Q to the environment?

1ST ELEMENT OF CONSTRUCT ITEMS:

Industrial Processes

ITEM 1 (Aluminium)

Aluminium is widely used in construction industry in Uganda. This has resulted into need for the material to meet the demands. According to a U.S. Geological Survey report, bauxite occurrences have been identified in the northern and eastern regions of the country. The government has cleared a local investor to set up a factory to produce the material so that he can tap into the opportunity. The community is puzzled about the process of extracting the mineral together with its effect on the environment and benefit other than employment. Through school Head Teachers, the Government has organized for Radio and Television talks for faster sensitization of the community and you have been chosen to represent your school.



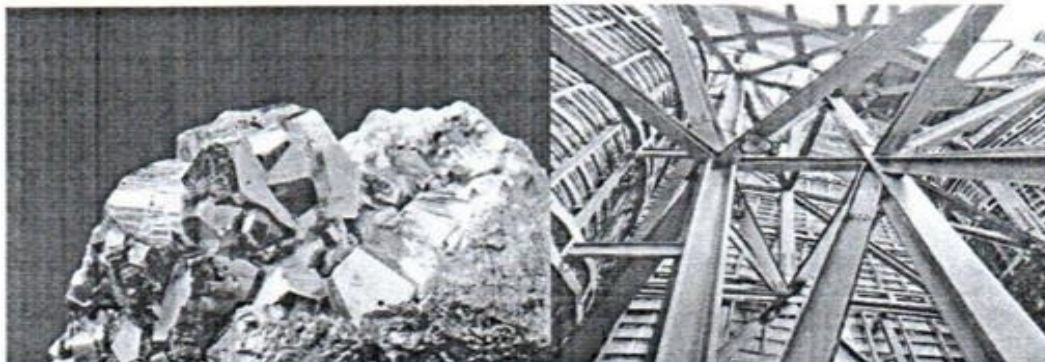
Task:

Make a write up of the presentation you will make.

ITEM 2(Iron)

Rushekye hills. in Kisoro district Uganda are found to contain significant iron deposits. An investor wants to set up an iron and steel rolling factory to tap into the opportunity. The local leaders are debating about the project. However, they seem not to understand how iron can be obtained from its raw materials and consequently its benefits.

As a SENIOR FOUR candidate with the knowledge of chemistry, the residents are confident that you can provide the necessary information.



Task

Prepare a presentation which you will use upon invitation

ITEM 3

Soap is one of the common substances that is used to facilitate washing. Of recent, there has been a countrywide complaint to the government of the high costs soap for use. This is partly because of the few industries producing soap is readily available and at a cheaper cost, recently the government cleared of the one of the local investors to set up another soap production plant in one of the villages in Tororo District. However, the community is concerned about its environmental impact and their valuable land that is about to be taken by the investor. The community members are also wondering how the process of soap production will be carried out. As a result, the chairperson science club in your school has chosen you to sensitize the members of the club on the situation.

Task:

As a chemistry learner, make a write up you will use during the presentation if you were invited.

Item 3:

A soapless manufacturing plant uses sodium hydroxide and benzene as the chief raw materials in the production process. To ensure that the detergent is readily available and at a cheaper cost, the manager is planning to set up a soap less detergent production plant near Lake Katwe in Kasese District.. Unfortunately, the residents have raised concerns about its environmental effects and their valuable land about to be taken by the investor. The science club in your school is also wondering how the production process of a soapless detergent will be carried out. As a result, the chairperson of the club has appointed you to make a presentation to be published in one of the local newspaper.

Task:

As a Chemistry learner, prepare a brief message that you will use during the presentation.

ITEM 5

In the steel industry, oxygen is blown into high carbon steel to remove impurities. In order to manufacture more pure steel, the government has set up a large oxygen manufacturing plant in kirasi town to manufacture more oxygen.

You were part of the group of students who visited the plant and production process, its associated side effects and social benefits were explained by one of the workers. On your return back to school, many senior 2 students have approached you so that you explain to them what you learnt while at the plant.

Task:

Make a write-up you can use to respond to concerns of senior 2 students.

ITEM 6

In a peri-urban town, several small-scale soap makers face a shortage of soap due to limited availability of sodium hydroxide, a key ingredient in soap production. The town has abundant coconut oil and palm oil, but the lack of sodium hydroxide restricts soap output and affects local businesses.

A local cooperative plans to establish a sodium hydroxide manufacturing facility to support soap production, but they have little knowledge about the production process and the environmental and safety issues involved.

They have requested your advice as a knowledgeable chemistry student.



Task:

Prepare a brief write-up you will present when invited by the cooperative.

Item 7 (manufacture of ethanol)

A regional hospital and several pharmaceutical companies are experiencing a shortage of medical alcohol used in the production of syrups, disinfectants, hand sanitizers, and drug preservation. As a result, the prices of medicines and sanitizers have increased. To curb this, the government of Uganda plans to set up an ethanol manufacturing plant. The government has advised the locals to take part in the process of production; however, they lack knowledge on how locally available materials can be used to manufacture ethanol. The T.C! has tasked a group of senior four students from your school to make a presentation during a workshop designated to train the locals about the process of production of ethanol, social benefits and side effects associated with the process of production.

Task:

As a chemistry learner, prepare a brief message that you will use during the presentation.

Item 8 (manufacture of bio gas)

Many of the homesteads in Nakasongola district, Uganda are facing a serious shortage of firewood used for traditional meats. The cost of buying firewood has greatly increased and the process of obtaining it involves cutting down trees which impose environmental challenges. The complaints of the locals have reached the district environmental officer, who though the government has decided to set up a biogas manufacturing plant. The residents in Nakasongola want to know the process of production of biogas, social benefits and side effects of the production process. The district education officer has invited your school to sensitize the locals on a radio talk show and you have been chosen to represent your class.

Task:

As a chemistry student prepare a write up you will use to address the locals.

Item 9 (sulphuric acid)

Kajja Agro-Farm in Western Uganda is struggling with low crop yields due to a shortage and high cost of fertilizer like ammonium sulphate acid, a crucial raw material in the production of ammonium sulphate fertilizer to address this the agro farm plans to build a plant to manufacture sulphuric acid. However, many residents are concerned about the production process and its possible effect on the environment. Students from your school have been encouraged to write articles.

Task:

Write the article advising the Agro-Farm farmers

Item 10 (lime)

Due to continued excessive use of artificial fertilizers in Masindi district in Uganda, there has been a decline in crop yields as a result of increased soil acidity threatening food security. The Agricultural analysts have advised the farmers to use lime in order to reduce soil acidity, but the community members do not know where to get the lime from, and they have requested the woman MP to lobby for them a lime manufacturing plant from the government. The request was approved but they lack knowledge of the manufacturing process, social benefit and side effect of the process. They have invited S.4 students from your school in one of their meetings to guide them on the matter.

Task

Write the presentation you will present to the community members.

PART II: EXISTENCE OF NATURAL RESOURCES IN THE ENVIRONMENT AND THEIR IMPORTANCE IN EVERYDAY LIFE

Item 1 (Air)

The steel manufacturing industry in Kawanda, significantly contributed to the local economy by producing essential materials. However, it emitted large amounts of pollutants in air, which affected the residents negatively. In response to community complaints, Kampala City Council Authority (KCCA) has organized a sensitization workshop on the affected natural resource under the theme '*Quality air. a dream for air*

Task

As a chemistry student, make a write up to sensitize the community about the matter upon invitation.

Item 2 (Water)

People living in Zengebe village in Nakasongola District have been practicing agriculture at the shores of lake Kyoga. They are now faced with a challenge of low water quality, The chairperson of Zengebe village has organized an emergency meeting with a theme *"everyone is responsible for water Conservation"*

Task:

As a chemistry learner who is a Member of the village, make a write up about the theme that you will present in Pie village meeting upon invitation.

Item 3 (Rocks and Metal-MS)

Kiwanga, a village in Mukono district in Uganda, has large deposits of granite rocks that are previously unused, because the community was focused on tanning. With population growth that has caused a need for infrastructural development, the government has cleared an investor to start the quarrying of granite rocks. However, the residents are scared of the challenges that will arise from this activity. The area Member of Parliament (MP) has therefore organized a sensitization workshop on the natural resource.

You have been selected to advise the people of the area.

Task:

As a chemistry student, make a write up you will use to present to the people of the area,

Item 4 (Trees and Vegetation)

Budongo Forest in Masindi District in Uganda has provided yet another economic activity which involve a practice of cutting down of trees for burning charcoal. Deforestation for sustenance is a vice that needs quick condemnation. Although many are able to gain income and provide for their families as they continuously gain profit. the National Forestry Authority is convinced that the activities carried out affect the

natural resource and has planned to make a sensitization in Masindi.

Task: As a young scientist who prefers to conserve environment, prepare a report that you would share with the tellers in Masindi

Item 5 (Oil)

The government plans to build a new oil refinery in Buseruka sub-county, Hoima District to exploit the natural resource and reduce on fuel prices. However, there is need first to educate local residents about the natural resource environmental impact of the human activity on the natural resource and its importance.

The science club at your school has volume to do the sensitization during holidays.

Task:

As a chemistry learner, make a write up you will use during the presentation,

CHEMISTRY PRACTICAL PART

CHEMISTRY PAPER 2/3 (P523/2)

ITEM 1

At Amai community hospital, medical workers regularly clean metallic instruments with acid solution before sterilization. A close inspection by a surgical team observed that some of the instruments were wearing out at a high rate due to strength of the acid used i.e. the stronger the acid the higher the rate of wearing. One of the ways of determining the strength of acids is by measuring the quantity of heat produced when an acid reacts with sodium hydroxide solution.

You have been tasked by the in charge to make a choice to use at this hospital supplied by respective two companies A and B.

You are provided with:

- BA1 sample of acid supplied by company A.
- BA2 sample of acid supplied by company B.
- W a solution of sodium hydroxide.
- Any other laboratory apparatus found in a chemistry laboratory.

Task:

- (a) Design and carry out an experiment you can use to make the right choice. (Your design should include aim, hypothesis, variables, apparatus and materials, procedure risks anti their mitigation.)
- (b) Show how you analyzed and interpreted your results

ITEM 2

A laundry service provider in one of the urban centers in Uganda has to choose the best water for effective washing with soap. He requested the men who supply to bring him samples from the two different water sources. He would want to discover which type of water minimizes soap wastage hence more effective in cleaning.

You are provided with:

BA1: Which a soap solution

BA2 which is water sample from supplier A

BA3: Which water sample from supplier B

Task:

As a learner of chemistry;

- (a) Design an experiment a laundry service provider can use
- (b) Carry out the experiment and record your findings.
- (b) Show from your findings how the laundry service provider can make choice on the type of water to be used

Item 3

James, a dealer in washing laundry uses soap to clean clothes where a good lather is formed in a fixed volume of water before washing begins. A new bore hole has been constructed by the government in the area where James operates from. There is a need to check for the suitability of the water from the bore hole before using it to avoid soap wastage. This is done by titrating 20cm³ of bore hole water with soap solution. Suitable borehole water should not use more than 30cm³ of soap solution. James does not know how it can be done and has come to you for help because he understands, you are knowledgeable.

You are provided with:

- BA1 which is 100cm³ of borehole water.
- BA2 which is 100cm³ of soap solution commonly used by James.
- Common apparatus for a titration experiment

Task

As a chemistry learner,

- Design an experiment you can carry out to help James. (In your design, include: Aim, hypothesis, variables, two risks and their mitigations, procedure with relevant materials.
- Carry out the experiment and record our results. (A minimum of three readings required).
- Analyze and interpret your results appropriately.
- What conclusion can you make of your results? Advise James.

ITEM 4

Kabiito, a herbalist in Kyatiri village Kiryandongo district uses herb extract to treat heart burn which is caused by hydrochloric acid produced by the stomach walls. Kent, a resident in the same village usually complains of heart burn whenever he eats beans. He has been advised by his friend to take Kabiito's herb extracts that contain basic substances that neutralises this hydrochloric acid. The best herb extract is the one which requires small volume of hydrochloric acid to be completely neutralised. Kent wants to choose the best herb extract but he does not know how to test it. His friend has told him to titrate a fixed volume of herb extracts separately with hydrochloric acid using a suitable indicator but still has failed to understand and hence he has approached you for more guidance. You are provided with:

- BA1 which is an extract from herb X
- BA2 which is an extract from herb Y.
- BA3 which is dilute hydrochloric acid
- Phenolphthalein indicator.

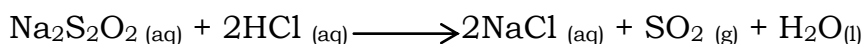
Task

As a learner of chemistry,

- Design an experiment you will carry out to help Kent.
(Your design should include aim, hypothesis, variables, procedure with relevant materials, risks and their mitigations).
- Carry out the experiment and record your results.
(a minimum of three readings required).
- Make analysis and interpret your findings.
- What conclusions and recommendations can you make.

Item 5

A factory uses sulphur as one of the ingredients to make fungicides which are used in the treatment of skin disorders. The sulphur use is obtained from the reaction between sodium thiosulphate solution and hydrochloric acid. This reaction occurs as follows:



The factory owners have realized the increasing demand for fungicides yet the supply is low. One of the workers?

Timely yield of sulphur needed will be possible if the rate of formation of sulphur is more than $3.0 \times 10^1 \text{ cm}^3$

You are provided with:

- BA1 which is sodium thiosulphate solution.
- BA2 which is dilute Hydrochloric acid
- Suitable laboratory apparatus for this experiment

Task

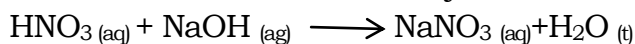
As a learner of chemistry:

- (i) Design an experiment you will carry out to prove the factory work's observation.
(You design should include: Aim, hypothesis, variables of experiment, procedure with relevant materials, risks and mitigations.
- (ii) Carry out the experiment and record you findings.
(A minimum of five readings required).
- (iii) Make analysis of your results.
- (iv) What conclusion and recommendation can you make from your findings?

Item 6

At the waste water treatment plant, nitric acid discharged in the waste water is neutralised using sodium hydroxide solution. However, the effective amount of sodium hydroxide used should produce heat less than 2.0KJ during the neutralisation process. The management has procured anew consignment X of sodium hydroxide for use but its suitability has not been tested. To test for its suitability, 30cm³ of nitric acid in a plastic beaker, is reacted with sodium hydroxide with temperature attained and the amount of heat produced calculated.

Nitric acid reacts with sodium hydroxide according to the following equation.



You are provided with the following:

BA1 which is a solution of nitric acid, equivalent to concentration in waste water.
BA2 which is a solution of sodium hydroxide from recently procured batch.

Task

As a chemistry learner.

- (a) Design an experiment you would carry out to help the management in determining the suitability of consignment X for the purpose.
- (b) Perform the experiment and record your results (A minimum of six readings required)
- (c) Analyse and enterpret your results.
- (d) What conclusion and recommendation can you make of your results.

Item 7

A metal scrap recycling company is exploring an innovative method to generate heat in food warmers. Their idea involves using Iron scrap in a process that displaces copper (II) Ions from a solution. This approach would potentially reduce use of polluting fossil fuels. However the company needs to determine if this method can produce a significant amount of heat, ideally above 50,000 Joules, to be a viable solution.

You are provided with:

Solid P which is a sample of Iron fillings from scrap

BA1 which is Copper (II) sulphate solution and some apparatus

Tasks

- (a) Design an experiment that can be used to determine the amount of heat evolved.
- (b) Carry out the experiment and determine the amount of heat involved.
- (c) Analyze the results and draw the conclusion?

END