

SAMPLE TEST ITEMS

SECTION A

1. APPLICATION OF CHEMISTRY IN DAILY LIFE

(Food additives, Drugs and medicines, Nuclear processes, Soapy and soapless detergents)

ITEM 1 (i)

On a wedding party guests were wondering and excited by the aroma and taste of the food served, that it so delicious,



The Master of Ceremony (MC) kept on notifying the people that the food had been prepared with knowledge of chemistry and some of the guests wanted to know what the Master of Ceremony meant

Task

As a chemistry learner, basing on the MC's communication advise the guests on:

- (a) The variety of the ingredients used.
- (b) The suitability of the ingredients
- (c) The possible problems associated with, and choice of the ingredients used.

ITEM 1 (ii)

In one of the societies in Kampala, there is an outbreak of bacterial diseases such as typhoid. The society members rely on each other for medical advice. Recently, a resident complained about persistent stomach ache followed by diarrhoea, but there was no one to advise on proper medication the society members should use.

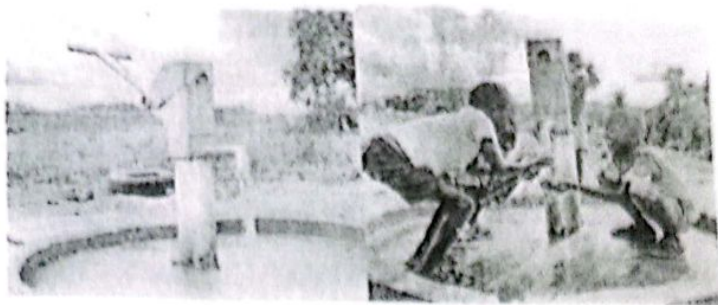
Task:

As a learner of chemistry;

- (a) Advise society members on the possible types of products to use?
- (b) Carefully educate them on what the products exactly do.
- (c) Advise them on the challenges associated with the product use and consequently how to select the products to use

ITEM 1 (iii)

In one of the towns in Uganda, residents are facing an unexpected challenge of water wasting detergents. The locals are frustrated and do not know what to do. They have been advised to try other alternatives on the market to overcome the challenge but they need more advice on this



As a concerned chemistry student in the town,

Task:

Help the residents,

- (a) understand the variety and mode of action of the detergents
- (b) on the consequences of the detergent

ITEM 1 (iv):

Due to increasing demand of power in Uganda, the government wants to adopt use of nuclear power.

However, there is little knowledge among the natives about how nuclear energy works. The ministry of energy and mineral development is interested in a knowledgeable person to sensitize the natives about the matter.

Task;

As a chemistry learner,

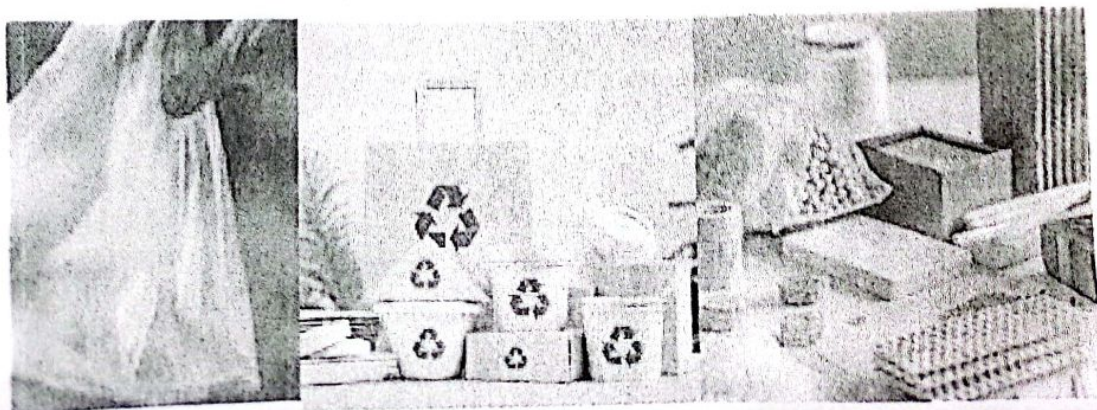
- (a) advise the natives on the types of processes that can be used by the government.
- (b) educate them on how the energy can be produced and **caution** them on the possible dangers associated with the process.
- (c) suggest to the residents on the most efficient process.

2. DIVERSITY AND INTERACTIONS OF SUBSTANCES AND THEIR IMPORTANCE IN LIFE

(Trends in the periodic table, polymers, periodic table, structure and bonds)

ITEM 2 (i):

A shop attendant wants to use environmentally friendly and sustainable packing materials. He is not having enough information about which packaging materials to use.



He has decided to seek for advice from a person with good knowledge of chemistry.

TASK

- help him appreciate that the packing materials are of different types
- advise him on the suitability of the materials

ITEM 2 (ii):

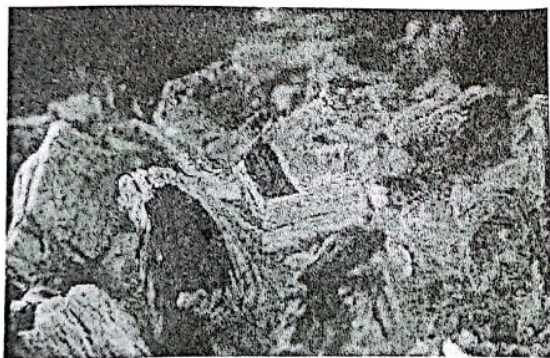
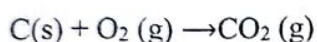
A group of Learners were faced with a unique solid substance, X, which they suspected to be an element. 0.3g of the element could burn in air to form 0.5g of the solid product. One of them picked interest in what could be the chemical formula of the oxide of the element. However, he did not know how to determine the formula. When they contacted the laboratory technician he gave them the atomic number and mass number of X as 12 and 24 respectively, and the symbolic representation of oxygen as $^{16}_8\text{O}$

As a student of chemistry help the learners to;

- understand the nature of substance X
- determine the formula of the oxide of X
- know the environmental consequences of the element

ITEM 2 (iii):

Charcoal is a common fuel used in many homes in Uganda. During its combustion in excess oxygen supply, it produces carbon dioxide. Your friend is using 80.5g of charcoal to cook food in a busy evening for guests. It burns completely as shown in the equation below.



Task

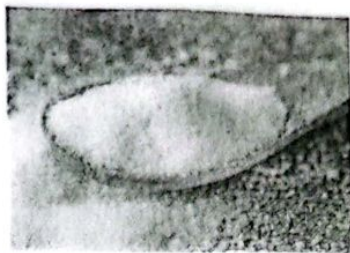
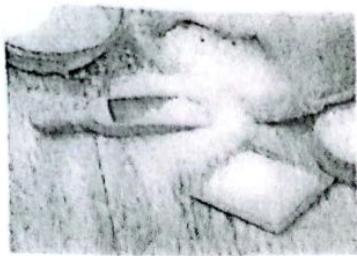
As a learner of chemistry

- Assess the product formed
- Advise the friend on the appropriateness of the product formed.
- Calculate the volume of the gas produced every busy evening.
(1 mole of a gas occupies 22.4l at s.t.p, C = 12)

Help the friend understand the impact of the product in the environment

ITEM 2 (iv)

A businessman was selling salt mixed with particles of sand, tricking people who couldn't notice the difference between the salt and its mixture with sand. This made it difficult for residents to use the salt. They need your help to prevent future problems and avoid any chemical dangers



They trust your chemistry knowledge to clarify the situation and prevent further suffering.

Task.

Help the residents:

- Know the behavior of the substances in the mixture.
- Evaluate the problems associated with the use of one of the component in the mixture

ITEM 2 (v):

A group of s.3 learners came across data on melting points of elements whose identities they forgot to capture. They brought it to s.4 learners to help them analyze and interpret the data for them.

Element	X	Y	Z	W	A	Q	M
Atomic number	11	12	13	14	15	16	17
M.P/°C	98	650	660	1410	44	119	-101

As a senior four learner with good knowledge about periodic trends,

- help them
 - understand the classes of the elements
 - on how to interpret the data.
- suggest to them the possible uses and environmental impact of the elements

SECTION B

PART I: CONTRIBUTION OF CHEMISTRY TO OUR ECONOMY

(Extraction of Copper, iron, aluminium, manufacture of nitric acid, sulphuric acid, fertilizers, ethanol, detergents, sodium hydroxide, chlorine gas, oxygen gas and cement)

ITEM 1 (Cement)

The price of cement in Uganda is so high. However, the people in authority are attributing this to the limited amount of cement in the country because of the few manufacturing industries. A resolution was made to set up another cement factory in your village in Tororo District. The village members are wondering how this will be done. But the chairman has called for a meeting and has requested you to give a talk to the members. As a chemistry learner,

TASK

Make a write up of your communication to the village members.

ITEM 2 (copper)

Uganda electrical engineer's forum has raised a concern of reduced copper wires in the country. In response, the government has contracted an investor to set up a new copper extraction plant in Kasese, copper ore rich district. Unfortunately, the investor has some doubts on his scientific knowledge on the production process and its likely impact on the environment.



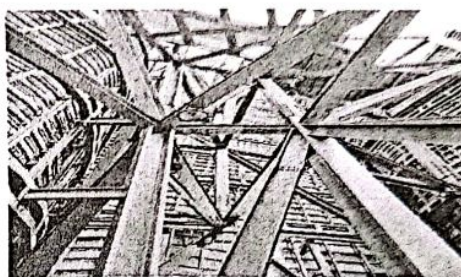
As a chemistry learner,

Task

Write a message to the investor to settle his doubts before his final interaction with residents.

ITEM 3 (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 4 (fertilizers)

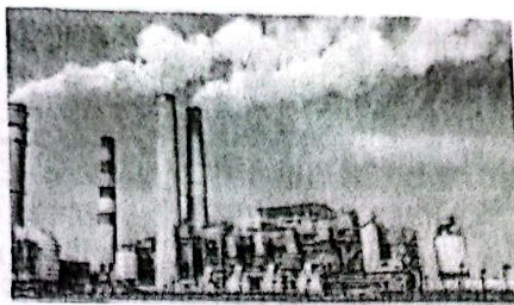
In Kabarole district most of the citizens survive on farming that involves growing of crops every season. For the last three seasons, farmers are registering a great decrease in the amount of the harvest they are making. The government has cleared a local investor to startup a fertilizer production plant in the district. However, the citizens are very much worried about the effects of the plant to the environment. The chairperson LC5 of the district has appointed you to sensitize the citizens of the area.

Task

Prepare a presentation you will make during the meeting.

ITEM 5 (chlorine and sodium hydroxide)

At Lake Katwe in Kasese District, Uganda, there are significant rock salt deposits. Discussions are underway in your class regarding the operations of a proposed chlorine plant. Students are unclear about how chlorine is manufactured from raw materials and its advantages.



They need guidance on the production process, emphasizing safety and environmental concerns.

Task

Write down your presentation in the discussion.

ITEM 6(oxygen)

There is high demand of oxygen in referral hospitals in Uganda. An investor was contacted by government to set up an oxygen manufacturing plant at Namanve, one of the swamps near Kampala to tap into the opportunity. However, the residents seem not to understand how the process will occur plus its consequences and are resisting the project.

As a **senior four** candidate with the knowledge of chemistry, you are required to create awareness to the members and provide the necessary information.

TASK

Write a presentation you will use upon meeting them.

Item 7(soapy detergents)

A parent of a senior four candidate in one of the villages in Kaberamaido District belongs to a “women’s development group”. The members of the group have come up with a project idea of making soap which they think they can sell to the nearby shops and obtain revenue. However, none of the members has knowledge about soap making. But the parent suggested a name of an s.4 candidate to the executive committee of the group as a rescuer and the committee has approached him/her for guidance.

As a chemistry learner,

TASK

Write a brief message that candidate will deliver to the group members.

Item 8 (soapless detergents)

People in Kisinza village only have access to borehole water which is not effective in cleaning clothes when soap is used. A local investor has been cleared by government to set up an industry that makes soapless detergents in the area however he is facing resistance from the community members about the issue of starting up the factory and he is equally lacking knowledge about the manufacturing process.

The head teacher has appointed you to go and represent the school in the meeting organized by the chairperson of the area to settle the wrangles between the investor and the citizens of the area.

TASK

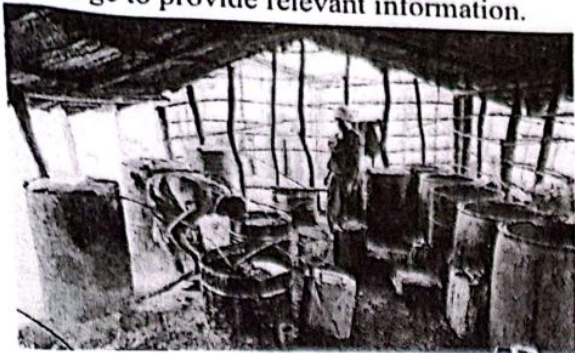
Write a message you would deliver in this meeting.

ITEM 8 (ethanol)

Many people in villages make a living by manufacturing local waragi (ethanol). However, the government is against the business due to associated challenges. The area Member of Parliament wants to sensitize the community about the large-scale production process and its impact to enable them understand the government position.

The area Member of Parliament has contacted you as a student with the knowledge of chemistry

in your village to provide relevant information.



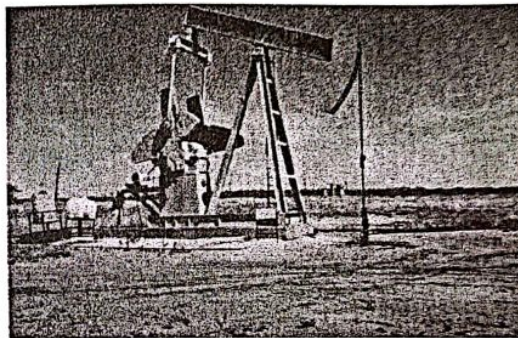
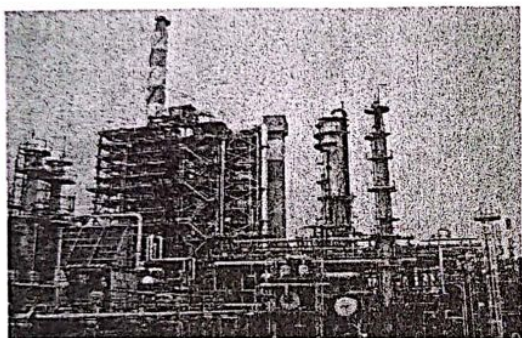
Task:

Make a write-up to use upon meeting the community.

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

ITEM 1 (Oil)

Recently, oil deposits were discovered in Western Uganda. A Chinese investor has been contracted by the government to extract the oil but the people around are scared of the outcomes. You have been invited by the LC chairman of that area to attend one of their meetings, and you are the only person who has some knowledge about natural resources, so the chairman has requested you to give a talk about the issue.



As a chemistry learner,

Task

Make a write up of your speech

ITEM 2 (rocks and minerals)

In Uganda, there are many mineral reserves and rocks. Due to the rapid population growth, their exploitation is causing proportional environmental degradation. The government through media houses wants to make public awareness on the matter.

Your school has been chosen to lead the environmental conservation campaign in your district. You have been chosen to present on one of the radio talk shows trusting your chemistry knowledge on natural resources.

TASK

Write down the information that can be conveyed

ITEM 3: (water)

Urbanization and industrialization have caused freshwater bodies to suffer from severe pollution. The Ugandan government aims to create public awareness regarding the natural resource through various initiatives.



One of the initiatives is to involve students with good knowledge of chemistry in radio talk shows.
TASK: Write the presentation you can use.

ITEM 4(air)

"Residents of Kampala are facing severe health risks due to poor air quality," was a headline in one of the recent editions of the New Vision newspaper. With the city's reputation tarnished and residents' health hanging in the balance, urgent action to raise awareness and clean the natural resource is needed, the paper continued to state.

The Kampala Capital City Authority (KCCA) is getting ready to improve the situation following the alarming revelation.

As a student of Chemistry who has learned about air as a natural resources

TASK

Write an article KCCA would use in response to the paper to sensitize the community of Kampala.

ITEM 5 (trees)

Uganda's forests are under pressure from illegal logging, agricultural expansion, and urban growth. Despite government attempts to advocate for sustainable forest management, these efforts have failed due to citizens' lack of awareness regarding the benefits and consequences.



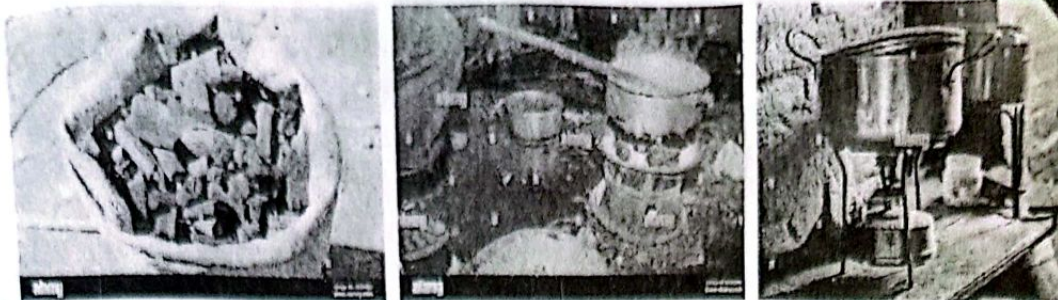
Use your chemistry knowledge to create awareness on the matter.

TASK.

Make a write-up you can use upon meeting the citizens.

Item 6 (carbon based fuels)

In Uganda, people are voicing concerns about prolonged drought and unpredictable rain seasons, leading to difficulties in farming planning. The officer in charge of agriculture attributes these issues to the overuse of charcoal and kerosene for cooking, citing their environmental implications. However, many natives seem to struggle to grasp the connection between their energy consumption habits and the broader environmental impact.



You are expected to close a gap in understanding between the officer's perspective and the community's perception of the situation

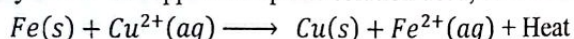
TASK

Help the natives understand this connection better.

PRACTICAL ITEMS

Sample Item 1

A company is investigating an appropriate chemical method to generate heat for portable stoves. The idea involves using iron scrap to displace copper (II) ions in a chemical reaction, offering an eco-friendly alternative to fossil fuel stoves. The company aims to determine how much heat is produced by the reaction for every 25cm^3 of copper II sulphate solution used, so that they make it a viable option for outdoor cooking.



You are provided with:

- Solid P which is sample of Iron fillings from scrap
- BA1 which is Copper (II) sulphate solution
- Some apparatus

TASKS

- Design an experiment that can be used to determine the amount of heat evolved
- Carry out the experiment and determine the amount of heat involved
- Analyze the results and draw the conclusion

Sample Item 2

When baking cookies the process involves mixing baking soda with vinegar to create a chemical reaction that generates carbon dioxide gas. The gas makes the cookies rise and become fluffy



One of the workers asked the manager why they use the powdered form not the granular form of the baking soda. The manager tried to explain the effect of particle size on the reaction but it still remained unclear to the worker. He took the worker to a laboratory and demonstrated using the reaction of magnesium with hydrochloric acid whose reaction rate also depends on particle size.



You are provided with;

- Magnesium powder
- Magnesium granules
- Hydrochloric acid
- Some apparatus

TASK

- (a) Design an experiment you would carry out to help the worker understand the manager's explanation
- (b) Carry out the experiment and record your findings
- (c) Analyze your results and draw a conclusion

Sample item 3

A chemical manufacturing company is testing a new lubricant for heavy machinery. It must have a freezing point above 60 to ensure it remains effective in extreme hot environments. The operations manager needs to verify whether the newly acquired lubricant meets this criteria to ensure its suitability for use.

You have been given a sample of solid P whose suitability as a raw material depends on its melting point.

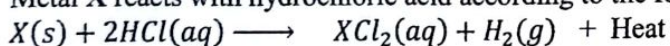
TASK

- (a) Design an experiment the factory can use.
- (b) Carry out the experiment and record your findings
- (c) Analyze the data and draw your conclusion

Sample item 4

A company is planning to use metal X and hydrochloric acid to produce hydrogen gas to be used in fuel cells for generating electricity. Heat generated or absorbed influences both the reaction speed and hydrogen quality. The company wants to determine the heat change for a reaction between the metal (X) and dilute hydrochloric acid to be able to make a decision on whether to use it or not.

Metal X reacts with hydrochloric acid according to the following equations;



You are provided with:

- Solid P which is sample of metal X
- BA1 which is a dilute solution of hydrochloric acid
- Some apparatus

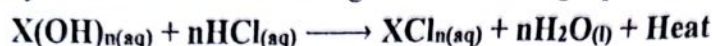
TASKS

- (a) Design an experiment that can be used to determine the amount of heat involved during the reaction
- (b) Carry out the experiment and obtain data to determine the amount of heat involved during the reaction.
- (c) Analyze the data and draw your conclusion

Sample item 5

A healthcare company is developing a new chewable antacid tablet and is evaluating the potential use of a specific alkali, represented as $X(OH)_n$, as the active ingredient. The company wants to confirm if heat produced varies with the volume of acid added to the alkali and how much heat is produced by the reaction, so that they are able to work on dosage.

The alkali reacts with hydrochloric acid according to the following equation.



You are provided with:

- BA1 which is a sample solution of the alkali
- BA2 which is dilute hydrochloric acid

TASK:

- (a) As a learner of chemistry;
- (i) Design an experiment to determine the heat produced for every 20cm³ of BA1 used
- (ii) Carry out the experiment and record your results appropriately
- (b) (i) Obtain the maximum heat produced for the volume of BA1 used
- (ii) What recommendation is useful to the company?

Sample item 6

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:

- (a) As a learner of chemistry;
- (i) Design an experiment a laundry service provider can use
- (ii) 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



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