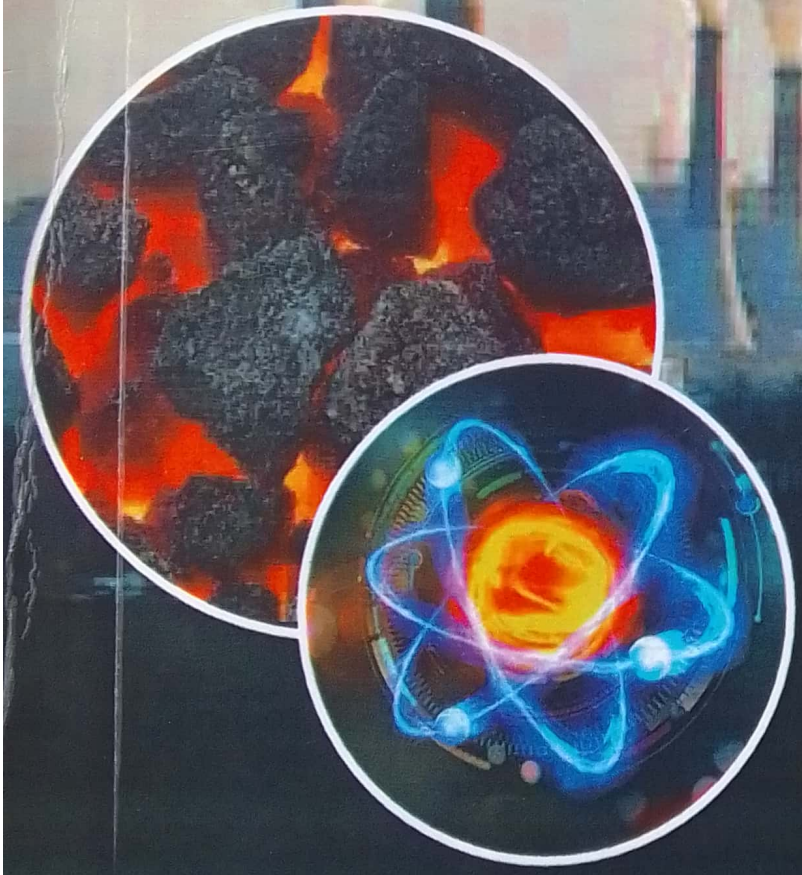
Approach To Lower Secondary

CHEMISTRY

PAPER ONE



EDITION 2024

UNIQUE FEATURES OF THE BOOK

- A comprehenssive guide to answering Paper 1 Scenario based items.
- Various assessment paper Series

KIBUGO Dennis

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S. 4.

Approach To Lower Secondary CHEMISTRY

545/1

[Paper ONE]

2024 EDITION

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PREFACE

This highly successful workbook presents clear to point chapter coverage in line with basis of assessment of each element of construct in UCE 545/1.

Each element of construct has been dissected to its fullest. To the facilitator of the class, this master piece provides tips and hints on how develop lesson notes with the learners.

To my dearest item takers (testees), this book contributes to development of an independent thinking, problem solving and scientific attitude across all chapters to be examined in theory paper at the end of the four years.

The various scenarios on each element area of assessment of respective element of construct will give a fine touch in preparation for the final national examinations.

So dear item takers, let's try out the various sets of exams provided in this handbook. We shall not regret.

To those reading this book, the author has given this mater piece time to come up with this master piece.

Nice reading!!!

ACKNOWLEDGEMENT

I thank the **almighty God** for the wisdom, knowledge a understanding given. The good health and life He has bles with me during the publication of this master piece.

Pastor Kwagala the lead pastor, assistant **Pastor Erina** and ent family of God's will ministries, Baita Ababiri- Entebbe. Thank y for serving and loving GOD. **Micah 5:9**

My parents **Salongo Busuulwa** Livingstone and **Nalongo Nank Gladys** not forgetting my brothers, sisters and entire family of M **Busuulwa** in Entebbe.

Special thanks to my dear wife, **Mrs. Nakawombe Esther Rachae** and entire family at home, **Maurice**, **Movia**, **Malcolm**, **Madrine**, **Majorine** and **Morgan**. Thank you for your moral support during the production of this book.

Senior teachers, **Mr. Obonyo Silver, Mr. Kasumba Wilson,** Mr **Butsiba Leonard, Mr. Wakalimira Umar** and entire chemistry departments at **St. Joseph SS Nagalama, Gayaza High school, St. Michael international school Wakiso, Bulo Parents SS Butambala, St. Julian high school** and **Midland High School.** Thank you all for the support

I cannot forget to thank the **Chemistry Educators Society (CES). Executive Municel- (CES President), Faridah Senyondo – (CES V/President), Pasha Ismail, Lawrence A. Bronsted, JS. Ngobi, Obonyo Silver** and **ALL members** of **Chemistry Educators Society** Thank you all.

Special thanks to **JUSAN Publishers Ltd (U)** for the entire publication of this master piece.

GOD is GREAT.

CONTENTS

TIPS TO THE FACILITATOR OF THE CLASS

What should happen during the teaching and learning process?

- ✓ Try to b ring the subject content to reality
- ✓ Show learners the applicability of the knowledge of the subject matter you are facilitating
- ✓ Use mini- scenarios that will help them to think critically ar apply the knowledge learnt.
- ✓ Be knowledgeable in the subject
- ✓ Know areas where knowledge of the subject can be applie in real life.
- ✓ Know what is happening in your country

As a facilitator of the class upon completing your lesson plan, design a summary of the content you intend learners to concentrate on in their research/findings. This is called an activity sheet. This tool guides them to write their own notes. Prepare this tool basing on the basis of assessment of that element of construct where that topic or concept falls.

For example;

My lesson today is on extraction of iron from haematite. The following activity sheet can be developed to guide the learning process.

Activity sheet

Raw material(s)	
Process of production -vessel used -chemical process involved -how can the ore be converted to iron	

ıow can the extracted iron be urified	
ikely side effects during roduction process	
ıow can these side effects be nitigated?	
Vhat can the community gain rom the iron plant and the effect of the benefit to the residents	

This activity sheet will guide learners to have main key points on what is expected of them.

New Terms Used In Assessment Of Competency Based Curriculum

Old knowledge based curriculum	New competency based curriculum
Questions	Items
Answers	Responses
Writing questions	Item development
Item writers	Item developers
Candidates	Test takers (testees)
Performance(s)	Achievement
Pass mark	Standard
Aggregates / grades	Achievement proficiency levels
Teacher	Facilitator

ELEMENT OF CONSTRUCT_EOC

Related competences (learning outcomes) that can be assessed together are grouped. This is to avoid duplication/multiple testing of competences. Each group is called an element of construct and only one item is set from that particular group. In chemistry, there are five elements of construct, four for theory and one for practical. In this book, we are to concentrate on the first four elements of construct to be set in theory.

A BREAKDOWN OF THE FIRST FOUR ELEMENTS OF CONSTRUCT.

FIRST ELEMENT OF CONSTRUCT_ EOC 1.

The learner appreciates contribution of chemistry to our economy. **(For items 3 and 4 in part one or 5 and 6 of section B)**

TOPICS;

- ✓ Industrial processes
- ✓ Air. (Mainly on manufacture of oxygen.)
- ✓ Chemistry and society.
- ✓ Carbon in life. (Mainly on crude oil, fermentation and saponification)
- ✓ Chemical reactions. (Mainly contactprocess)
- ✓ Oxidation and reduction. (In iron extraction and for concepts of electrolysis in extraction of aluminium, copper, manufacture of sodium hydroxide and chlorine)

ASSESSABLE AREAS

(a) Manufacture of oxygen/nitrogen gas (b) Manufacture of chlorine gas (c) Extraction of metals (Al, Fe, Cu) (d) Manufacture of fertilizers (mainly ammonium nitrate) (e) Manufacture of detergents (soapy and soapless)	(f) Manufacture of sodium hydroxide (g) Manufacture of sulphuric acid (h) Manufacture of cement and lime (i) Manufacture of Ethanol (j) Fractional distillation of crude oil	Each Process involves V – vessel Cp – chemical processes Cd – conversion to desired product Ch – coherence Pr -purification

BASIS OF ASSESSMENT

Basis of assessment		Criteria of assessment	Score
A	Raw materials (Rm)	All raw material	02
		any one raw material	01
		no raw material	00
B	Process of production (Pp)	Process of production with all V, Cp, Ch, Pr	03
		Process of production with any three of V, Cp, Ch, Pr	02
		Process of production with any one of V, Cp, Ch, Pr	01
		No process of production	00
C	Side effects of the process of production and mitigation (Se)	Any one danger identified, explained and mitigated	03
		Any one danger identified and explained OR identified and mitigated OR explained and mitigated	02
		Any one danger identified OR explained OR mitigated	01
		No danger identified, explained or	00

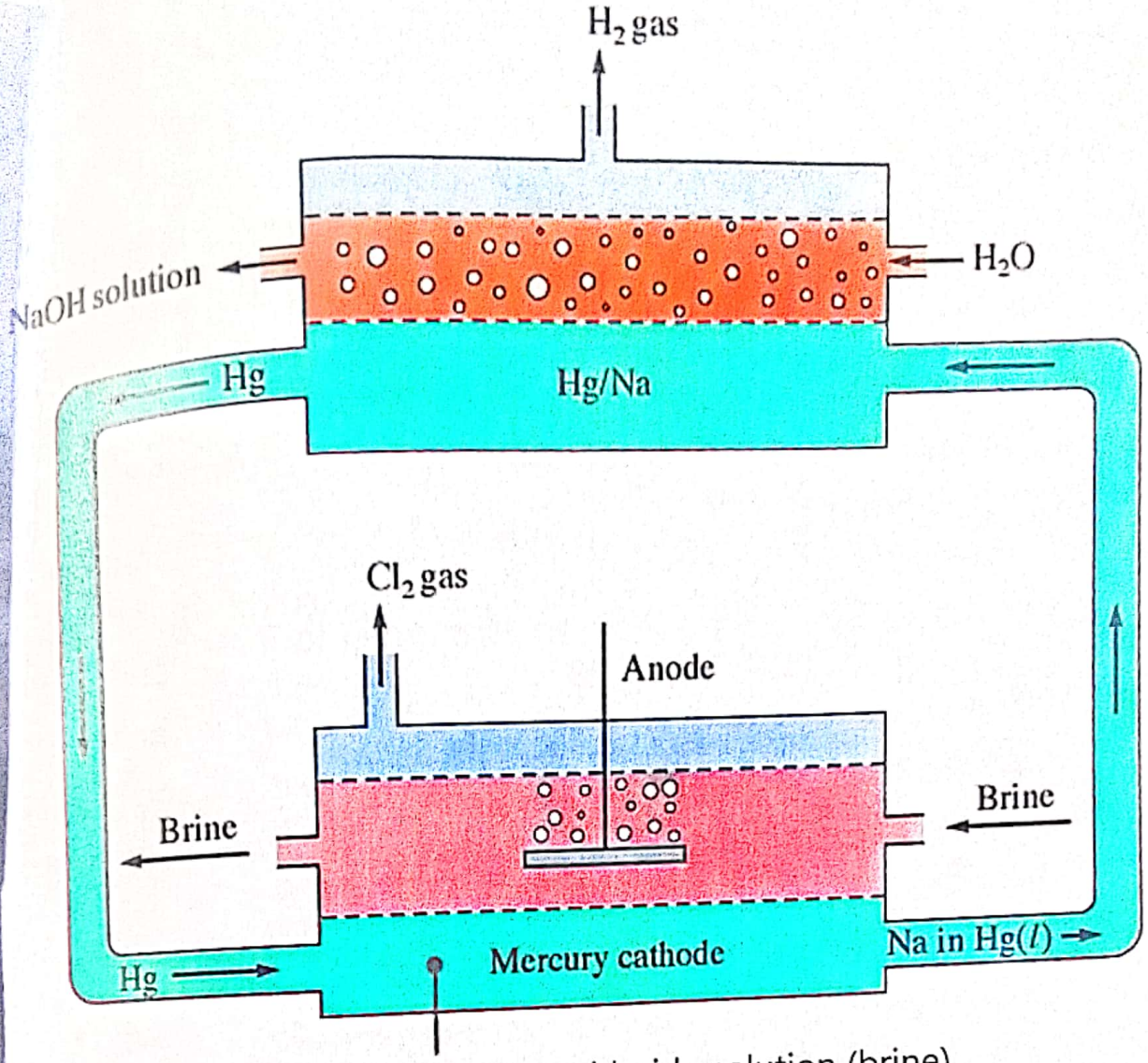
		mitigated	
D	Social benefits (Sb)	Any one social benefit identified, effect of the benefit and impact of the benefit	03
		Any one social benefit identified and effect of the benefit OR identified and impact of the benefit OR effect of the benefit and impact of the benefit	02
		Any one social benefit identified OR effect of the benefit OR impact of the benefit	01
		No social benefit identified	00

Summary notes on the assessable areas for EOC 1.

Summary notes on the assessable areas for EOC 1.

MANUFACTURE OF CHLORINE GAS USING MERCURY CATHODE CELL

The Mercury cathode cell



Raw materials; Concentrated sodium chloride solution (brine).

Process of production

Chlorine is manufactured by electrolysis of concentrated sodium chloride solution (Brine) using graphite anode and flowing mercury as the cathode in a **mercury cathode cell**.

Brine contains sodium, chloride, hydroxide and hydrogen ions.

The ions migrate to oppositely charged electrodes.

At the anode chloride ions are discharged, in preference to hydroxide ions; being in higher concentration than hydroxyl ions. chlorine gas is formed.

$$2\,Cl^-\,(aq) \longrightarrow Cl_2\,(g) + 2e$$

The chlorine is dried, liquefied and stored in tightly closed tank

Alternatively; By DOWN's Process

Raw material; Sodium chloride crystals (Rock salt)

Process of production

Solid sodium chloride (rock salt) and little calcium chloride are fed Down's cell. The mixture is electrolysed using titanium or graphite anode and steel or iron cathode.

The ions migrate to oppositely charged electrodes.

At the anode,chloride ions are discharged forming chlorine gas.

$$2\,Cl^-\,(l) \longrightarrow Cl_2\,(g) + 2e$$

The chlorine formed is collected and stored in tightly closed tanks

The Chlorine is dried, liquefied and stored.

Side effects and mitigation

Exposure to mercury due to leakage in the cell which is highly toxic and may cause **damage to nervous and reproductive systems** on long exposure to the workers and this can be mitigated by **proper use of required personal protective equipment.**

Social benefits

Employment opportunities; increased **income** among residents hence **improved standards of living.**

MANUFACTURE OF SODIUM HYDROXIDE USING MERCURY CATHODE CELL

Raw materials; concentrated sodium chloride solution (brine).

Process of production;

Chlorine is manufactured by electrolysis of concentrated sodium chloride solution (Brine) using graphite anode and flowing mercury as the cathode in a **mercury cathode cell**.

Brine contains sodium, chloride, hydroxide and hydrogen ions.

The ions migrate to oppositely charged electrodes.

At cathode;

Sodium and hydrogen ions migrate to the cathode however sodium ions are preferentially discharged to hydrogen ions.Sodium ions gain an electron forming sodium metal.

$$(Na^{+}_{(aq)} + e \longrightarrow Na_{(s)})$$

The sodium metal formed reacts with mercury to form sodium amalgam.

The sodium amalgam is then dissolved in water forming **sodium hydroxide solution,** hydrogen and mercury which is then recycled into the cell.

$$(2Na/Hg_{(l)} + H_2O_{(l)} \longrightarrow 2NaOH_{(aq)} + H_{2(g)} + 2Hg_{(l)})$$

Sodium hydroxide solution is then evaporated to saturation and th cooled to form pure pellets of sodium hydroxide and stored in tigh plastic containers.

Side effects and mitigation

- **Exposure to mercury** due to leakage in the cell which is highly toxic and may cause **damage to nervous and reproductive systems** on long exposure to the workers and this can be mitigated by **proper use of required personal protective equipment.**

- **Poisonous fumes by waste gases** which when inhaled can cause **respiratory disorders**. This can be mitigated by **fitting catalytic converters** in exhaust pipes of the machines to convert toxic chlorine to other non toxic compounds.

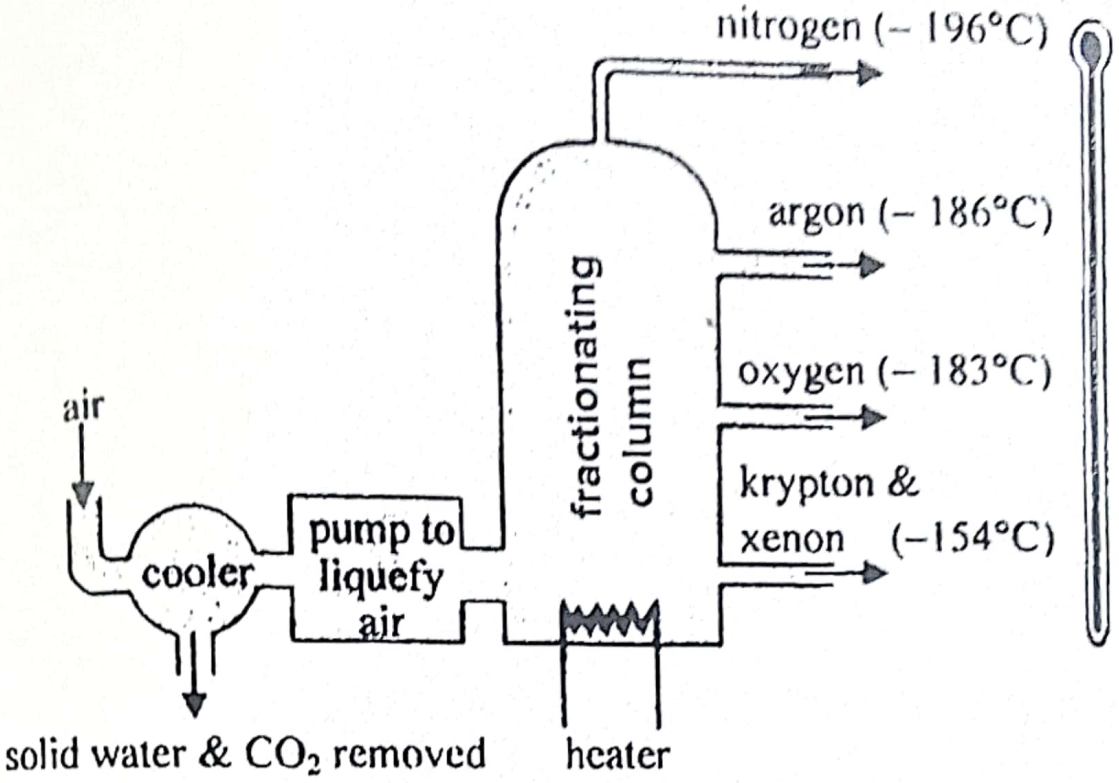
Social benefits

Employment opportunities; increased **income** among residents hence **improved standards of living.**

MANUFACTURE OF OXYGEN

RAW MATERIALS; Air.

PROCESS OF PRODUCTION



Air is passed through air filters to remove dust and smoke particles.
Air is passed through concentrated sodium hydroxide solution to remove carbon dioxide.
Air is then passed through silica gel to absorb water vapour.
Carbon dioxide and water vapour are removed from air before it is liquefied because they solidify and block the apparatus.
The remaining components of air are repeated compressed at 200 atmospheres and allowed to cool at about -200^0 C. to obtain liquid air
The liquid air is fractionally distilled using a fractionating column.
Nitrogen boils off first because it has a lower boiling point (-196^0 C) leaving behind oxygen with a higher boiling point (-183^0 C). Both nitrogen and oxygen collected obtained contain traces of noble gases.
Pure oxygen is then stored under pressure in steel cylinders.

SIDE EFFECTS AND MITIGATION

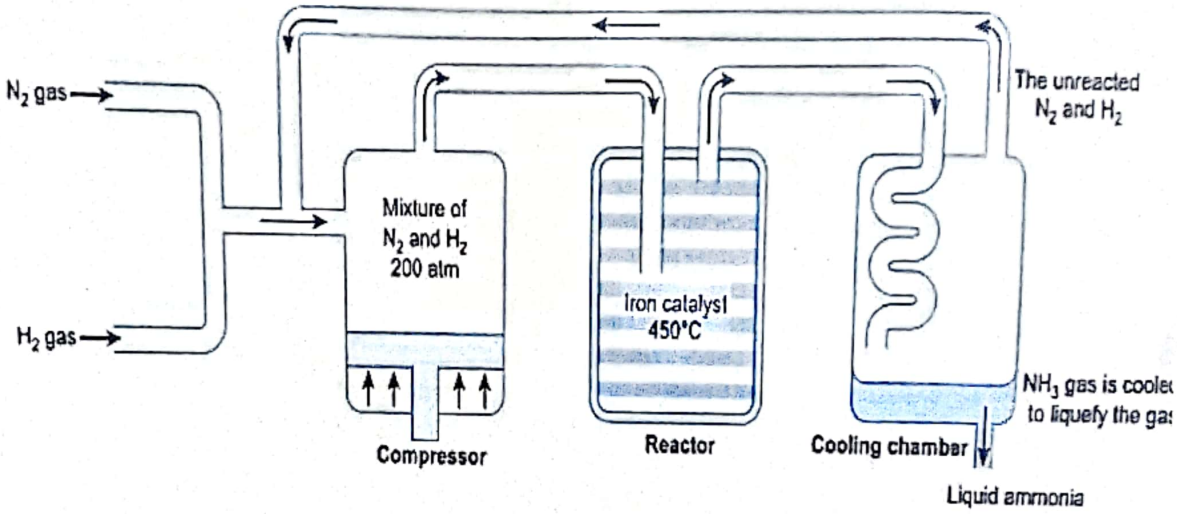
Explosion of oxygen cylinders due to high pressure. This can cause other materials to **catch fire injury to people**. Mitigation can be done by **regular maintenance and monitoring of cylinders**.

SOCIAL BENEFITS

Employment opportunity; improved **income** thus **better standards of living**.

MANUFACTURE OF AMMONIA GAS.

Raw materials; nitrogen and hydrogen gases.



Nitrogen and hydrogen gases are reacted in a **reactor** at high pressure (200atmospheres) and low temperature (450^0c) in a ratio of 1:3 in presence of finely divided iron catalyst **to form ammonia gas.**

$$N_{2\,(g)} + 3H_{3\,(g)} \longrightarrow 2NH_{3\,(g)}$$

Ammonia is then purified by **methanation process.**

Side effect and mitigation.

Noise pollution from compressors that may cause **discomfort and hearing problems** to the residents. This can be mitigated by use of **sound proof** in production rooms.

Social benefits.

urce of **employment opportunities** leading to **increased income** nong residents hence **improved standards of living**.

MANUFACTURE OF AMMONIUM NITRATE FERTILIZERS

Concentrated nitric acid is reacted with ammonia gas in a reaction vessel forming nitric acid.

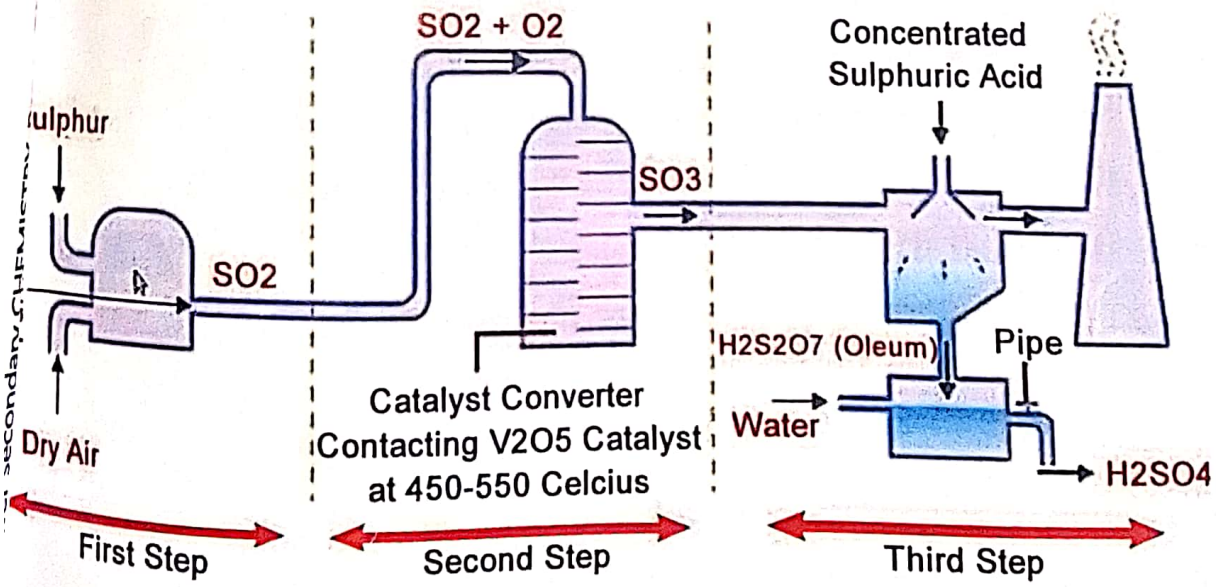
$$HNO_3(aq) + NH_3(g) \rightarrow NH_4NO_3(aq)$$

The ammonium nitrate solution is further concentrated and evaporated to dryness to solid form and packed for storage.

MANUFUCTURE OF SULPHURIC ACID

Raw materials; Sulphur dioxide gas, oxygen gas

Process of production;



Dry Sulphur dioxide gas free from impurities is heated with dry pure oxygen gas at low temperature (of about 450°C), high pressure (of about 1-3atm) in presence of vanadium(V) oxide catalyst forming Sulphur trioxide. This occurs in a **catalytic chamber**

$$2SO_{2\,(g)} + O_{2\,(g)} \longrightarrow 2SO_{3(g)}$$

Sulphur trioxide is dissolved in little concentrated Sulphuric acid forming fuming liquid called Oleum in a tank.

$$SO_{3\,(g)} + H_2SO_{4\,(l)} \longrightarrow H_2S_2O_{7\,(l)}$$

Oleum is added to a regulated volume of distilled water form 98% concentrated Sulphuric acid.

$$H_2S_2O_{7\,(l)} + H_2O_{(l)} \longrightarrow 2H_2SO_{4\,(l)}$$

Side effects and mitigation

- **Hot surface burns** from combustion cylinder causing **wounds hence pain** to workers and this can be mitigated by **proper use of required personal protective equipment.**
- **Poisonous fumes by waste gases** which when inhaled can cause **respiratory disorders**. This can be mitigated by **fitting catalytic converters** in exhaust pipes of the machines to convert oxides of Sulphur into nitrogen and carbon monoxide to carbon dioxide,

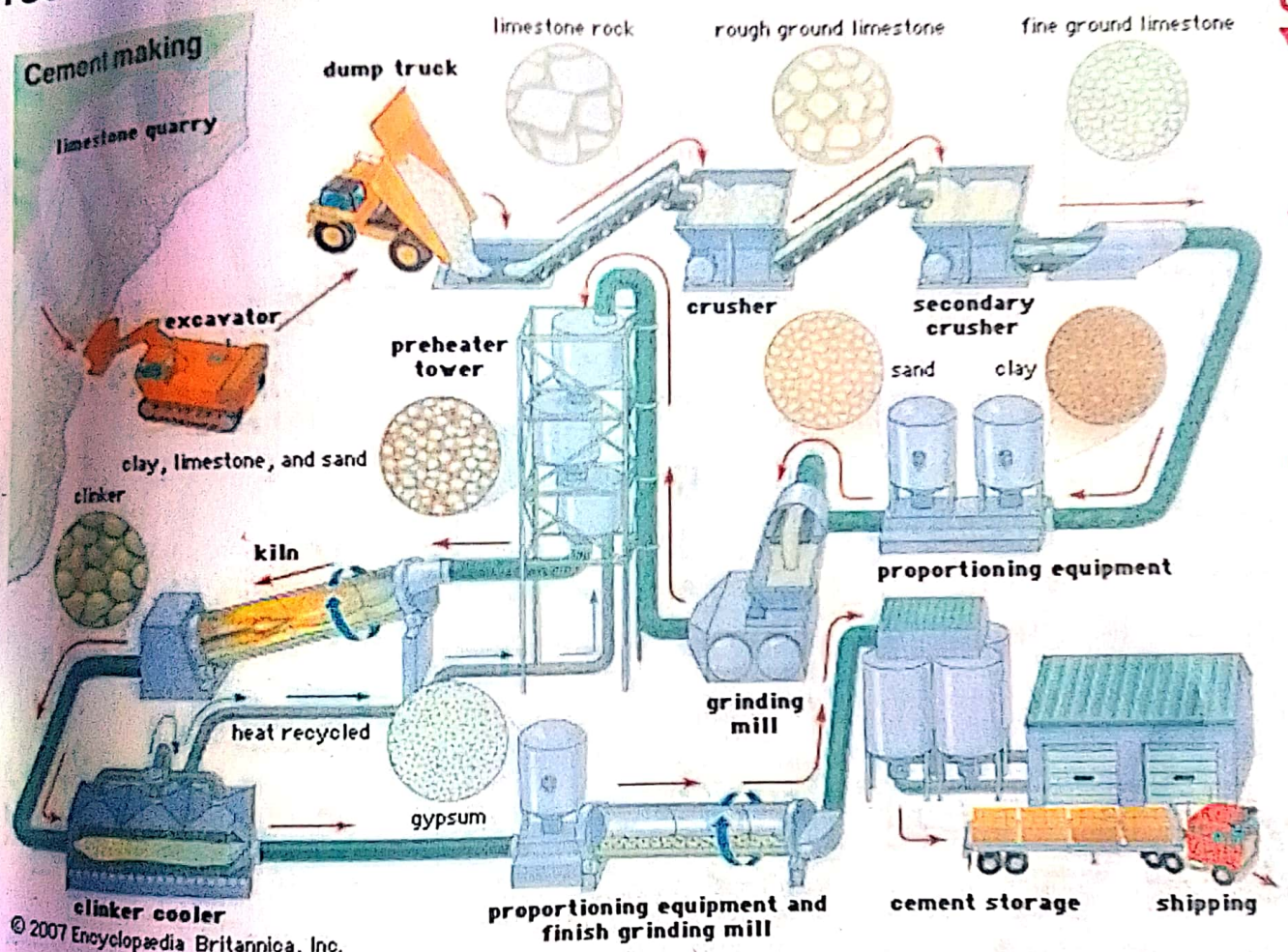
Social benefits

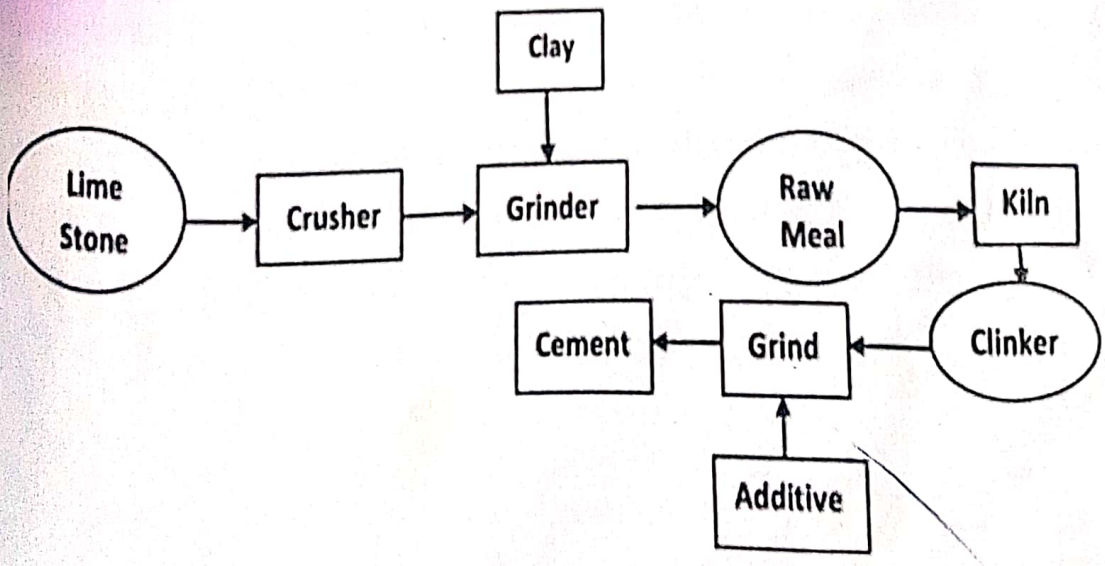
Employment opportunities; increased **income** among residents hence **improved standards of living.**

MANUFACTURE OF CEMENT

Raw materials: Limestone ,clay and gypsum.

Process of production





A mixture of limestone and clay is crushed into fine powder.
The fine powder is then mixed with little water and allow to flow do into a **rotating drum** (cylinder) in which it is strongly **heated**.
Limestone decomposes forming calcium oxide and carbon dioxide.
Calcium oxide and aluminium oxide **react** with silicon dioxide forming lumps of calcium silicate and aluminium silicate respectively.
The lumps are crushed to **form cement** as a fine powder.
Gypsum is added during the grinding process to moderate the setting of cement.
Cement is packed in bags and ready for use.

Side effects and mitigation

Dust particles during the crushing process that cause **air pollution leading to respiratory disorders** to workers and this can be mitigated by **proper use of required personal protective equipment.**

Social benefits

Employment opportunities; increased **income** among residents hence **improved standards of living**

Or; The plant is a source of **government revenue** leading to **improved social infrastructures** like roads, health centers, and schools hence **better standards of living** among residents.

MANUFACTURE OF ETHANOL

Raw materials; Starch, malt and yeast

Process of production

The starch containing substance is crushed (or some are roasted) to extract starch. Malt is then added to starch in a **container** and it is then covered. Malt contains an enzyme, diastase that catalyses hydrolysis of starch to maltose.

Yeast is then added to maltose after about 5 days at room temperature.

The maltase in yeast catalyses the hydrolysis of maltose to glucose.

Zymase enzyme in yeast catalyses the breakdown of glucose to crude ethanol and carbon dioxide.

$$C_6H_{12}O_{6\,(aq)} \longrightarrow 2C_2H_5O_{(l)} + 2CO_{2(g)}$$

Crude ethanol is converted to pure ethanol by fractional distillation.

Side effects and mitigation

Hot surface burns from distillation tanks that cause **wounds hence pain** to workers and this can be mitigated by **proper use of required personal protective equipment.**

Social benefits

Employment opportunities; increased **income** among residents hence **improved standards of living.**

MANUFACTURE OF SOAPY AND SOAPLESS DETERGENTS

A) Soapless detergents (non-soapy)

Raw materials; Benzene, concentrated Sulphuric acid, concentrated sodium hydroxide solution

Process of production

Benzene is reacted with a long chain alkene in presence of concentrated Sulphuric acid in **a plastic container** forming alkylbenzene.

The alkylbenzene is heated with concentrated sulphuric acid and then concentrated sodium hydroxide solution added to the resultant solution forming a detergent.

This mixture can be added to minimum volumes of water to form liquid form detergents.

Some additives such as whitening agents, biological enzymes, fragrances, stabilizers may be added during the process.

Side effects and mitigation

- **Acids pills on surfaces** that may cause falls/accidents leading **injuries** on workers. This can be mitigated by **careful handlin** of the acid **or** Posting hazard and warning information in the working area.
- **Burns from acids** when in contact with the skin **causing wounds**. This can be mitigated by **careful handling** of the acic

B) Soapy detergent

Raw materials;

Vegetable oil (animal fat) and concentrated sodium hydroxide solution.

PROCESS OF PRODUCTION;

A mixture of vegetable oil or animal fat and concentrated sodium hydroxide solution is boiled while stirring until no more reaction occurs in a boiler (metallic container). The resultant soap solution is cooled. Concentrated sodium chloride solution is added to soap solution to precipitate out the soap.

Soap floats and it is skimmed off.

Additives like perfumes and dyes may now be added.

Soap is baked into desired bars and it is stored.

Side effects and mitigation

- **Hot surface burns** during the boiling process causing **wounds hence pain** to workers and this can be mitigated by **proper use of required personal protective equipment.**

Social benefits

Employment opportunities; increased **income** among residents hence **improved standards of living.**

FRACTIONAL DISTILLATION OF CRUDE OIL

Raw material; Crude oil/ Rock oil.

Process of production

- Crude oil from an oil field is separated from its impurities such sand, water.
- Crude oil is then pumped to the refinery
- At the refinery, fractional distillation is used to separate the crude oil into several fractions using their difference in boiling points
- The oil is heated into a furnace and vapour rapidly pumped / fe in to a fractioning tower whose temperatures vary (hotter at the bottom and cooler at the top
- As the oil vapour rises up the tower, each component is re-distilled.
- Sulphur as an impurity in the fraction can be removed by desulphurization process e.g., Hydrodesulphurization

Side effects and mitigation.

- **Explosion of pipes** due to high pressure. This can cause other materials to ignite spontaneously/**catch fire**. Mitigation can be done by **keeping cylinders in cool areas.**

- **Air pollution by waste gases** (such as hydrogen sulphide and ammonia) in case of any leakage. This may **cause stomach and respiratory disorders**. This can be mitigated by **regular maintenance and monitoring** of cylinders.

- **Leakage of hydrogen sulphide** as a waste gas that can cause **acid rain** which leads to crumbling of buildings. This can be mitigated by **regular maintaince and monitoring** of cylinders.

- Fire and explosion since most of the products are highly flammable with law flash points. The resulting fire can cause damage to equipment, Nearby crops and people

This can be mitigated by designing a fire and explosion protection systems and regular maintenance.

- Air pollution by waste gases that cause acidic rains leading to crumbling of walls of buildings.

Social benefits

Employment opportunities; increased **income** among residents hence **improved standards of living**

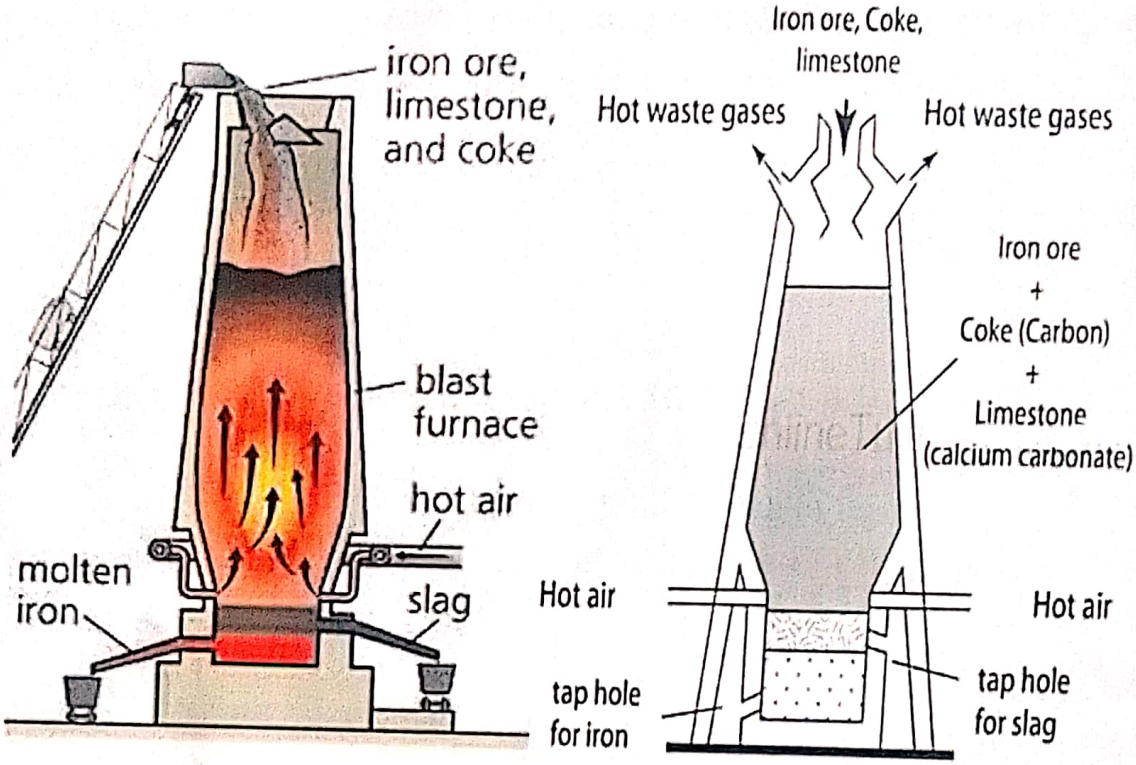
Source of government revenue through taxes leading to improved social facilities such as schools,hospitals,roads etc. This leads to improved standards of living among the residents

EXTRACTION OF IRON

Raw materials;

- Haematite
- Coke
- limestone.
- Hot air.

Process of production



Haematite, coke and limestone are fed into a **blast furnace** from the top. Hot air is blown from the bottom of the furnace.

Coke is oxidised by hot air forming carbon dioxide. The carbon dioxide formed reacts with unreacted(excess) coke reducing it to carbon monoxide. Carbon monoxide reduces haematite **to molten iron** and carbon dioxide given off in the process.

Limestone decomposes to calcium oxide and carbon dioxide. The calcium oxide formed **reacted** with silicon dioxide, which is an impurity, forming calcium silicate that is **tapped off**.

Side effects and mitigation

Hot surface burns causing **wounds hence pain** to workers and this can be mitigated by **proper use of required personal protective equipment.**

Social benefits

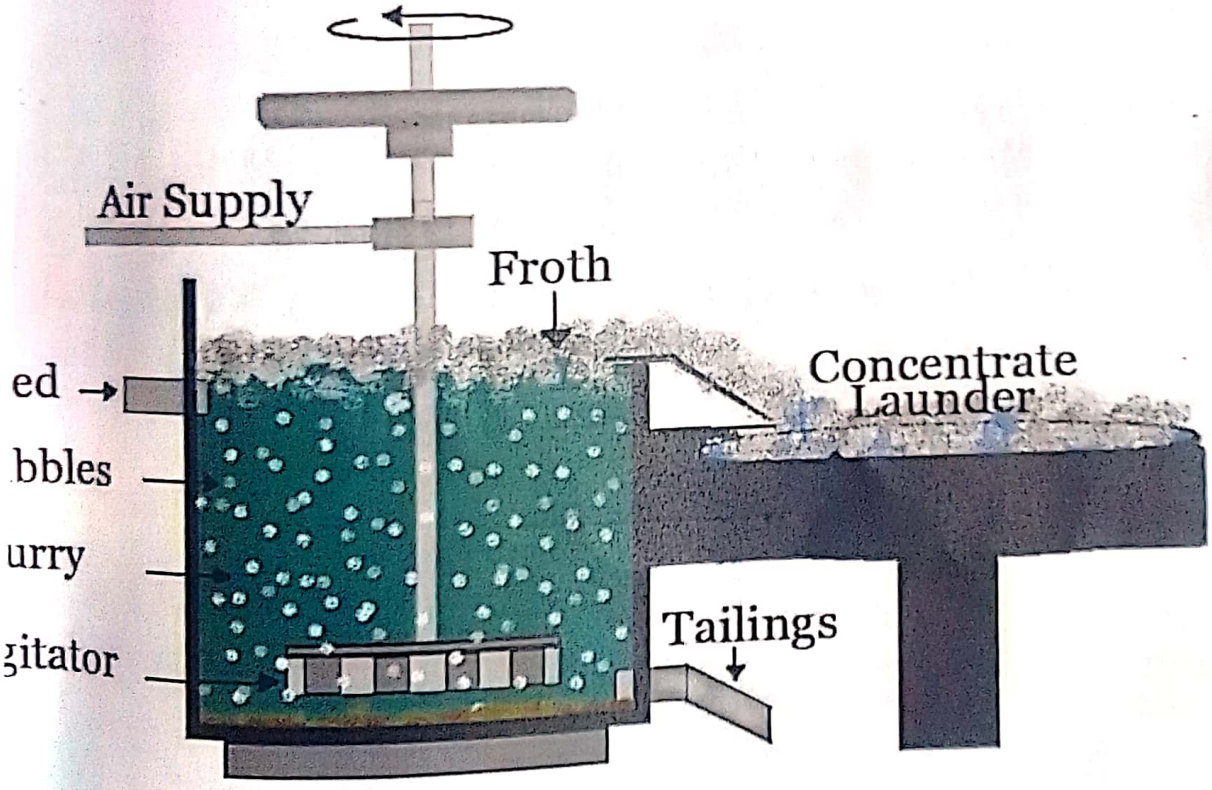
Employment opportunities; increased **income** among residents hence **improved standards of living**

EXTRACTION OF COPPER

Raw materials; Ore (copper pyrites)

Process of production Silicon(IV) oxide.

FLOTATION PROCESS



- The ore is concentrated by froth flotation in a **concentration tank** (**container**).

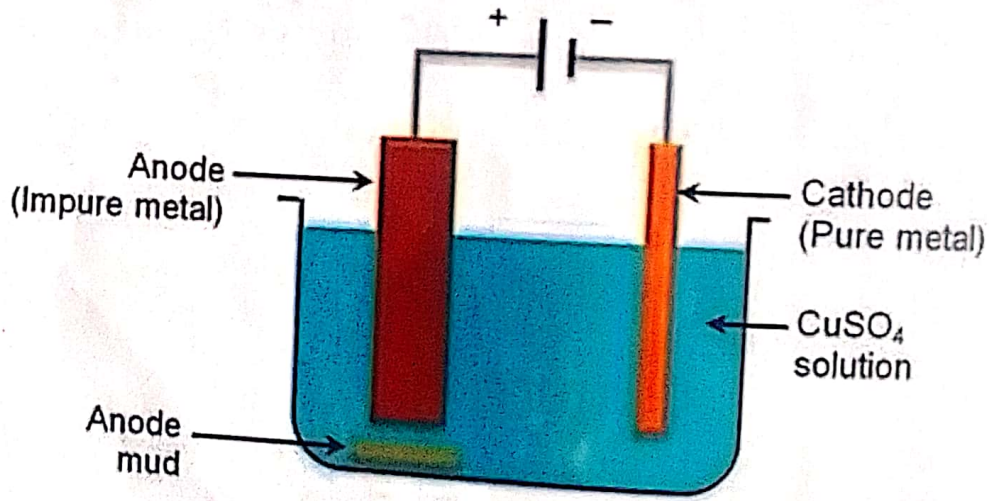
❖ The concentrated dry ore is then roasted in air to produ copper(I) Sulphide, iron(II) Oxide and Sulphur dioxide.

❖ The silicon dioxide is added to the mixture and heated in absence of air in a furnace.

❖ The iron(II) oxide is reacted with silicon dioxide to form molten slag of iron (II)silicate.

❖ Copper(I) Sulphide is heated in controlled supply of air to **form impure copper** (blister copper).

The impure copper is purified by electrolysis using acidified copper(II) Sulphate solution as the electrolyte.



The anode is made of impure copper and cathode is made of pure copper.

- At cathode; Copper(II) ions are discharged to form copper which is deposited at the cathode and collected as **pure copper**.

$$Cu^{2+}{}_{(aq)} + 2e \longrightarrow Cu(s)$$

Side effects

- Toxic fumes produced from production process can lead to suffocation and hence death and this can be mitigated by **fitting catalytic converters** in exhaust pipes of the machines or Proper use of personal protective equipment
- Sulphur dioxide produced as a waste gas dissolves in water forming acidic rains that plants and crumbs on walls of buildings. This can be mitigated by creating a sulphuric a manufacturing plant round the area to use this Sulphur dioxide.

ocial benefits.

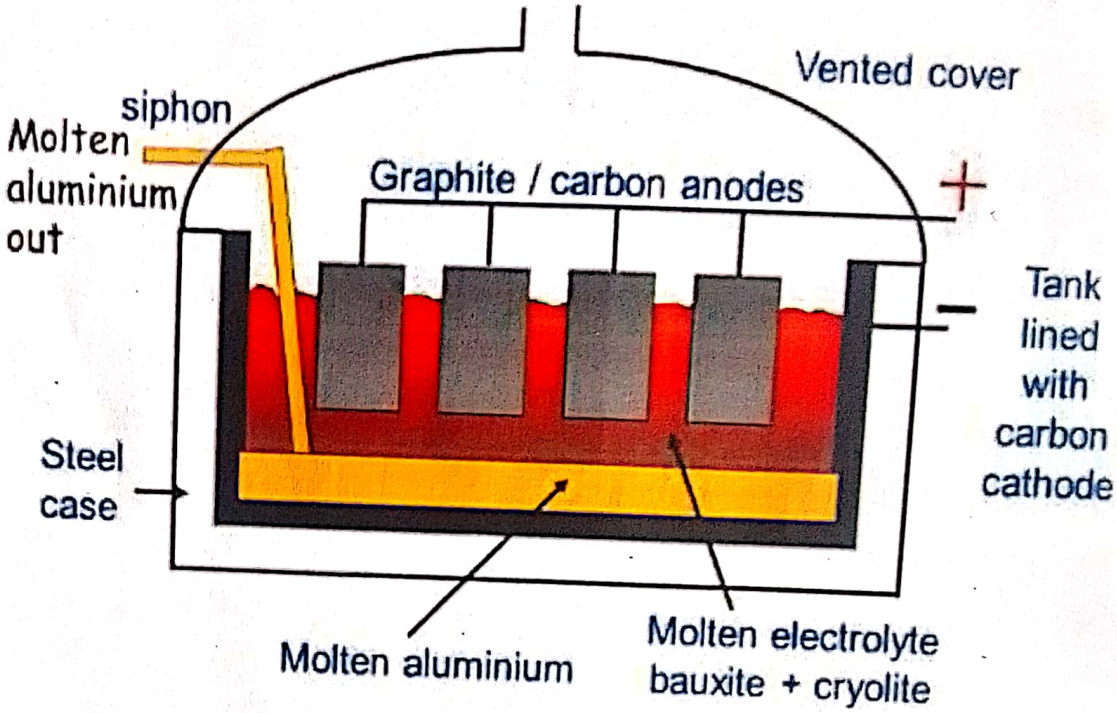
ource of **employment opportunities** leading to **increased income** among residents hence **improved standards of living**.

EXTRACTIONOFALUMINIUM

Raw materials: Ore (Bauxite)

Steel case

Process of production



The ore is first roasted in air to drive off any water in it.
The ore is then crushed into fine powder and concentrated with hot concentrated sodium hydroxide solution in **a container** to form pure aluminium hydroxide by **Bayer's process**.
The aluminium hydroxide is heated to form pure aluminium oxide.
The aluminium oxide is dissolved in molten cryolite to lower its melting point to about 800^0c.
The molten aluminium oxide is electrolysed between graphite electrodes

At anode $Al^{3+}_{(l)} + 3e \longrightarrow Al_{(l)}$

Side effects and mitigation

- **Hot surface burns** causing **wounds hence pain** to workers and this can be mitigated by **proper use of required personal protective equipment.**
- **Poisonous fumes by waste gases** which when inhaled can cause **respiratory disorders**. This can be mitigated by **fitting catalytic converters** in exhaust pipes of the machines to convert oxides of nitrogen into nitrogen and carbon monoxide to carbon dioxide,

Social benefits

Employment opportunities; increased **income** among residents hence **improved standards of living.**

SECOND ELEMENT OF CONSTRUCT _ EOC 2

Appreciates the application of chemistry in daily life. (For items 1 or 2)

TOPICS;

- ✓ Chemistry and society
- ✓ Chemicals for consumers. (Mainly food additives, medicine and drugs and detergents).
- ✓ Nuclear processes.

ASSESSABLE AREAS

1.food additives		2. Drugs and medicine	3. Nuclear processes	4. Deterge
Flavour enhancer Preservatives Glazing agents Gelling agents Anti-oxidants Bulking agents	Dyes (food colors) Stabilizers Thickeners Biological Enzymes. Whitening Agents. Firming agents	**Antibiotics** (penicillin & streptomycin) **Analgesics** (Aspirin, paracetamol codeine)	Nuclear fission Nuclear fusion Nuclear decay and half life	Soapy Detergent Soapless detergents

BASIS OF ASSESSMENT

Basis of assessment		Criteria of assessment	Score
A	Category/type of product	Any one product and category/type of product identified	02
		Any one product or category/type of product identified	01
		no product nor category/type of product identified	00
B	Function(s) of product(s)	Anyone function of product(s)	01
		No function of the product(s)	00
C	Dangers or Side effects of the product and mitigation	Any one danger/side effect identified explained and mitigated	03
		Any one danger/side effect identified explained and mitigated	02
		Any one danger/side effect identified and explained OR explained and mitigated	01
		No danger/side effect identified OR mitigated	00
D	Evaluation of	Evaluation of products/processes	02

)	products/processes	basing on both similarities and differences	
		Evaluation of products/processes basing on either similarities OR differences	01
		No evaluation of products/processes	00

Summary notes on the assessable areas for EOC 2.

A. FOOD ADDITIVES

Basis of assessment	Expected responses
Category of the product	**Food additives** such as flavour enhancers, food colours, food preservatives etc. **(depending on the scenario set)**
Functions of the product	**Food enhancers**; boost existing food flavours **Food colour**; add colour to the food **Food preservatives**; increase the shelf life of food **Emulsifiers**; stop oils in food from clotting **Artificial sweeteners**; improve on sweetness of food. **Antioxidants;** -prevent food from oxidizing or going bad **Food acids** (e.g. oranges, lemons) ; maintain the right acid levels in food.
Dangers/sideeffects + explanation + mitigation	Some people are **allergic** to some synthetic food additives that may lead to **skin irritation (or making one to lose concentration)** or diarrhoea on prolonged use. **Or** Natural food additives quicken the rate of food spoilage due to rapid growth of microbes. This can be mitigated by; use recommended amounts/limiting their use
Evaluation ofthe product (any one)	**Similarities;** - both make food delicious. (in case of food enhancers) -Both can preserve food (in case of food preservatives) (This depends on the food additive being mentioned in the scenario). **Differences** -Natural food additives are less effective in action thansynthetic -Natural food additives have fewer side effects thansynthetic -Natural food additives are extracts of plants, animals or minerals while synthetic are as a result of chemical reactions.

B. NUCLEAR PROCESSES

<table>
<tr><td>Basis of assessment</td><td>Expected responses</td></tr>
<tr><td>Category of the product</td><td>Nuclear processes are classified as
1. Nuclear fission.
2. Nuclear fusion</td></tr>
<tr><td>Functions of the product</td><td>Nuclear fission;
- used in nuclear reactors of generate electricity from nuclear energy
- Used in atomic bombs.
Nuclear fusion;
-It is a fuel</td></tr>
<tr><td>Dangers/side effects
+ explanation

+ mitigation</td><td>-Radiations may lead to mutations in DNA leading to hereditary defects like leukemia
-Radiation burns on the skin.
-Reduced fertility
-Radiations damage the liver

-Proper disposal of atomic wastes
-Proper use of correct personal protective equipment</td></tr>
<tr><td>Evaluation of the product</td><td>Similarities;
- both involve a large release of energy.

Differences
<table>
<tr><td>Nuclear fission</td><td>Nuclear fusion</td></tr>
<tr><td>Heavy nuclei split to lighter nuclei</td><td>Lighter nuclei join to form heavy nuclei</td></tr>
<tr><td>Can take place at ordinary temperature</td><td>Takes place at high temperature</td></tr>
<tr><td>Very high energy released</td><td>Relatively low energy released</td></tr>
<tr><td>Occurs in heavy nuclei</td><td>Occurs in lighter nuclei</td></tr>
</table></td></tr>
</table>

C. MEDICINE AND DRUGS

Basis of assessment	Expected responses
Category of the product	Medicine and drugs are classified as; **MEDICINES** e.g., Aspirin is a medicine that is analgesic
Functions of the product	Depending on the scenario **Analgesics;** pain killers (reduce on inflammation thus reducing pain) **Anti-biotics;** kill bacteria in the body.
Dangers/side effects + explanation	Some people are allergic to some modern medicine that may lead to skin irritation or diarrhoea on prolonged use.
+ mitigation	-use recommended dose
Evaluation of the product	**Similarities;** - Both are pain killers. (Depending on the scenario) -Both are antibiotics. (Depending on the scenario) **Differences** -Herbal medicines are less effective in action than synthetic -Herbal medicines have fewer side effects than Modern -Modern medicines have recommended doses unlike traditional medicines.

D. DETERGENTS

Basis of assessment	Expected responses
Category of the product	Detergents are classified as 1. soapy detergents (soap) 2. soap less detergents

Functioning of the product	- A detergent/ soap molecule contains two parts namely; the hydrophilic part (loves water but hat dirt) and hydrophobic part (loves dirt but hates water). -During washing, the surface tension between wa and oil/dirt is lowered. -With constant agitation, the dirt is removed off t cloth.

<table>
<tr><td>angers/side effects
explanation
mitigation</td><td>For <u>soapy detergents</u>.
• Soap contains chemicals that can cause Skin burns and hence pain.
• Eye redness and pain hence loss of vision.Mitigation;
thoroughly washing the affected areas.

<u>Soapless detergents</u> contain phosphates, an algae nutrient leading to algae bloom that cuts off oxygen supply to the aquatics. Eventually, leading to suffocation and hence death
Mitigation;
Proper disposal of detergents</td></tr>
<tr><td>Evaluation of the product</td><td>Similarities:
-Both are salts of Organic acids of long carbon chain.
-Both are effective cleansing agents in soft water

Differences;<table><tr><th>Soapy detergents</th><th>Soapless detergents</th></tr><tr><td>Forms scum with hard water.</td><td>does not form scum with hard water</td></tr><tr><td>Gentle on skin when using it.</td><td>not gentle on skin</td></tr><tr><td>Biodegradable</td><td>Non-biodegradable</td></tr></table></td></tr>
</table>

THIRD ELEMENT OF COSTRUCT _ EOC 3

Appreciates the diversity and interactions of substances and their importance in everyday life. (For items 1 or 2)

TOPICS;

- ✓ Air
- ✓ Using materials
- ✓ The periodic table
- ✓ Trends in the periodic table
- ✓ Structures and bonds

- ✓ Reactivity series
- ✓ Structure and properties of substances
- ✓ Carbon in life
- ✓ Formulae, stoichiometry and mole concept

ASSESSABLE AREAS

(a) Elements, compounds and mixtures (b) The periodic table (c) Trends in the periodic table (d) Reactivity series	(e) Structure and bonds (f) The mole concepts (g) Materials other than plastics (h) Polymers and Plastics

BASIS OF ASSESSMENT

Basis of assessment		Criteria of assessment	Score
A	Category of element, compound, substance or material with a reason	Identified category of element, compound, substance or material with a reason and example	03
		Identified category of element, compound, substance or material with either example OR reason	02
		Identified category of element, compound, substance OR material OR reason only OR example only	01
		No identified category of element, compound, substance OR material OR reason OR example	00
B	Properties or prediction of properties of element, compound, substance OR material	At least four properties or characteristics or predictions of trends	03
		At least two properties or characteristics or predictions of trends	02
		Any one property or characteristic or prediction of trends	01
		No property or characteristic or	00

		prediction of trends	
C	Uses of element, compound, substance or material/applications/ quantity of matter i.e moles	Any one use/application	01
		No use/ application	00
D	Impact/ pollution of environment by element, compound, substance or material and mitigation	Identified impact and mitigation	02
		Identified impact OR mitigation	01
		No Identified impact OR mitigation	00

Summary notes on the assessable areas for EOC 3.

POLYMERS

Polymer	Category + reason	Properties	Uses	Impact of environment + mitigation
Nylon	Synthetic polymer ;man-made	• Strong • Flexible • Tough • Durable • Lightweight • Chemical resistant • Elastic	• Making clothes, ropes, curtains, carpets, parachutes and car seat belts	• If burnt, produces toxic fumes **Mitigation**; Recycling. • Non-biodegradable; **Mitigation**; Recycling.
Perspex	Synthetic polymer; man-made	• Strong • Weather resistant • Chemical resistant • Heat resistant • lightweight	• Making lenses and reflectors. • Making protective screens	• If burnt, produces toxic fumes **Mitigation**; recycling

Polythene	Synthetic/artificial polymer; man-made	• Tough • Insoluble in all solvents • Good electrical insulator	• Making polyethene plastics • As an insulator	• Non-biodegradable; • Are flammable and can produce toxic fumes when burned; **Mitigation**; Reduce, reuse and recycle.
Wool	Natural polymer; exists in nature thus God-made	• Absorbs and releases moisture quickly • Durable • Is an insulator and thus very warm	• Making coats, socks, and sweaters • Making blankets, rugs and carpets • As insulation material in building • mattresses, and pillows.	• Sheep farming produces greenhouse gases such as methane hence global warming; **Mitigation**; • Implement pasture management
Silk	Natural polymer ; exists in nature	• Soft • Light weight (low density) • Smooth • strong • Shines • Good insulation	• Making clothes	

Natural rubber	Natural polymer; exists in nature	• Soft • Sticky • Not elastic • Low tensile strength • Can be improved by a process called vulcanization of rubber. **Properties of vulcanized rubber** are; • Greater tensile strength • Strong • Durable • Elastic	• Making tyres, shoe soles, erasers, carpets, gloves, condoms, belts and tubes.	
Cotton	Natural polymer; exists in nature	• Can easily be decomposed by fungi and bacteria. • Strong • Soft • Absorbs moisture	• Making bandages, gauze, sanitary products • Making threads, ropes and canvas • Making paper products such as currency, stationary, banknotes etc. • Making clothing	

Polyester	Synthetic polymer; man-made	• Strong • Water resistant • Wrinkle resistant • Dries quickly when wet • Moisture wicking • Chemical resistant	• Making rain jackets, umbrellas. • Making sportswear.	• If burnt, produces toxic fumes **Mitigation**; Recycling

USING MATERIALS

Material	Category of material	Properties of material	Uses of material	Impact of environment by material + mitigation
Wood	Natural material; exists in nature.	• Readily available • Cheap • Strong • Light when dry • Easy to smoothen • Can rot or be eaten by termites when not treated	• Making shutters for doors and windows. • Making door flames and window flames. • Making struts and ties during roofing. • Making poles, pillars and beams	• Unsustainable logging practices can lead to deforestation, loss of biodiversity, and habitat destruction. **Mitigation**; -Selective logging, -reforestation.

Glass	Artificial material; man-made.	• Transparent • Strong • Fire resistant • Reflective, attractive • Tinted glass allow light to pass through it in only one direction	• Making shutters for doors and windows. • Making walls	• Glass solid wastes can harm the environment if not properly managed. **Mitigation**; recycling
Bricks and block	Artificial material; man-made	• Strong • Fire resistant	• Constructing walls	• Clay and stones are mined from the earth, leading to habitat destruction and soil erosion. **Mitigation**; incorporate recycled materials into brick production

Approach to Lower secondary CHEMISTRY_Paper ONE (545/1) Author_Kibugo Dennis

Iron	Artificial material; man-made	• Very strong (can support heavy load) • High tensile strength (resists breakage) • Ductile and malleable (easy to mould) • High melting points (resists fire)	• Making shutters for doors and windows. • Making door flames and window flames. • Iron nails used to fix/join objects like timber, iron sheets. • Used for plumbing.	• Deplete soil fertility when it accumulates. • Being a heavy metal can cause cancer. • Non-biodegradable **Mitigation;** promote use of recycled iron products
Alumini u-m	Artificial material; man-made	• Low density (lightweight) • Strong • Durable • Has bright appearance • High electrical/heat conductivity • High melting point (resists fire)	• Making shutters for doors and windows. • Making door flames and window flames. • Reinforcing. • Electrical installations, wire. • Making roofing materials (struts and ties).	• Deplete soil fertility when it accumulates. • Non-biodegradable. **Mitigation;** promote use of recycled aluminium products

...tic	Artificial material; man-made	• Flexible • Water proof • Light and strong • Low melting points (can be easily attacked by fire)	• Making pipes for plumbing. • Making door and window shutters.	• Non-biodegradable spoils the soil. **Mitigation**; -recycling
...ortar	Artificial material; man-made	• Hard • Adhesive (can join bricks together)	• Joining and binding bricks • Making concrete for floors • Plastering walls	• Bulky and take long to decompose and so can spoil the soil. **Mitigation**; should be crushed for reuse.
Ceramic...s	Artificial material; man-made	• Water proof • Brittle (easy to break) • Good looking • Cannot be attacked by chemicals.	• Making bricks • Making tiles (floor tiles) • Making roofing tiles	• Clay used in ceramic production are often mined from the earth, leading to habitat destruction, soil erosion and land scape alteration. **Mitigation**; incorporate recycled materials into ceramic production.

ELEMENTS

Element	Category of element with reason	Properties of element	Uses of element	Impact of environme + mitigation
Sodium	Metal; -loses outermost electron to form a cation.	• Low melting point • Ductile • Lightweight • Conducts electricity • Soft • Shiny appearance	• Used as a coolant in nuclear reactor. • Used to make alloys like sodium amalgam. • Used as a reducing agent in the extraction.	• High level of sodiu can disrupt natural ecosystems in area where plants and animals are adapted to salty conditions leading to change in biodiversity. **Mitigation;** Reduced use of sodium-based fertilizers.
Magnesium	Metal; - loses outermost electrons to form a cation.	• High melting point • Conducts electricity • High density • Strong • Shiny appearance	• Used as a fertilizer to replenish soil nutrients and promote plant growth. • Used to make alloy like duralumin • Used in electronic devices such as laptops, smartphones and cameras	• Overapplication of magnesium-containing fertilizers can lead to soil contamination and nutrient imbalances, affecting plant growth and soil health. **Mitigation;** • Adopt nutrient management practices.

Aluminiu m	Metal; Loses electrons to form a cation.	• Lightweigh t • Conducts electricity • Strong • Ductile • Malleable • Sonorous • Corrosion resistant	• Used in packaging materials such as foil wraps. • Used in constructio n i.e. roofing, window frames, doors. • Used in electrical transmissio n. • Making cookware, furniture, sporting equipment and electronic casings	• Aluminium productssuch as packaging materials contributeto landfill waste. **Mitigation;** recycling

Silicon	Metalloid; shows both characteristics of metals and non-metals	• High melting point	• Used in production of semiconductors for electronics like computer chips, solar cells. • Used to make alloy like iron-silicon alloy. • Used in medical implants such as pacemakers and joint replacements	• Disposal of silicon-based products can contribute to e-waste; Mitigation; reuse, recycling silicon-based materials,
Phosphorous	Non-metal; gains electrons to form anion.	• Soft • Waxy solid that glows in the dark	• Used to make match heads. • Used to make alloy. • Used in production of phosphoric acid which is used to make fertilizers, detergents.	• Excess phosphorous runoff causes eutrophication in water bodies which leads to algal blooms, oxygen depletion, fish kills, and degradation of aquatic habitats; Mitigation; Upgrade wastewater treatment plants to remove phosphorous effectively before discharge in water bodies.

phur	Non-Metal; loses electrons to form anion	• Yellow crystalline solid.	• Used in vulcanizatio n of rubber. • Used in paper production and pulp to bleach the pulp. • Used in production of gun powder and other explosives.	• Sulphur; containing compounds can leachinto soil and water, affecting ecosystems and aquatic life; **Mitigation;** • Manage Sulphur-containing wastematerials
hlorine	Non-Metal; loses electron to form negative ion (anion).	• Exist as a greenish-yellow gas.	• Used in water treatment. • Used in production of bleaching agents for textiles, paper and pulp industry. • Used in production of PVC.	• Exposure to chlorinecan harm terrestrial and aquatic ecosystem. • Chlorine form toxic by-products such dioxins and furan that bioaccumulate inthe environment; **Mitigation;** • Substitute chlorinewith safer alternatives.

Argon	Inert gas; neither gains nor loses electron(s).	• Exist as gas • Non-reactive	• Used as a filler gas in incandescent light bulbs. • Used in beverages and food industry for packaging perishable goods such as wine to displace oxygen and extend shelf life. • Used in welding.	• Production processmay contribute to greenhouse gas emissions; **Mitigation;** • Reduce on energyusage.

FOURTH ELEMENT OF COSTRUCT_ EOC 4

Appreciates the existence of natural resources in the environmen and their importance in life. (For part II on items 5 and 6, or part items 3 and 4-depending on the item developer of the day)

TOPICS.

- ✓ Air
- ✓ Water
- ✓ Rocks and minerals
- ✓ Carbon in the environment
- ✓ Fossil fuels

ASSESSABLE AREAS

(a) Air (b) Water (c) Rocks and mineral resources	(d) Carbon based fuels (e) Fossil fuels

SIS OF ASSESSMENT

sis of assessment		Criteria of assessment	Score
	Identity of category of natural resource, reason and example	Identified category of natural resource with a reason and example	03
		Identified category of natural resource with a reason OR Identified category of natural resource with example	02
		Identified category of natural resource OR example	01
		No identified category of natural resource	00
B	Composition of natural resource	Any two components of natural resource	02
		Any one component of natural resource	01
		No component of natural resource	00
C	Impact of the human activity on the natural resource, how it occurs, and mitigation	Anyone Impact of the human activity onthe natural resource, how it occurs, and its mitigation	03
		Anyone human activity onthe natural resource and how it occurs OR Anyone Impact human activity onthe natural resource, and its mitigation	02
		Anyone human activity onthe natural resource OR how it occurs OR its mitigation	01
		No Impact of human activity onthe natural resource, how it occurs, and itsmitigation	00
D	Benefit/importance of natural resource	Any one benefit/importance of natural resource + explanation	02
		No benefit/importance of natural resource	00

Summary notes on the assessable areas for EOC 4.

Basis of assessment	Expected responses
Category +Reason/explanation +example	• **Renewable Natural resources**; can be replenis e.g. Air, water. • **Non-renewable resources**; cannot be replenished(get used up) e.g. fossil fuels, rock minerals.
Composition of natural resources	• **Air** contains Nitrogen, Oxygen Carbon dioxide rare gases, **(any two components mentioned)** • **Water** contains; Hydrogen and oxygen. • **Fossil** fuels contain Carbon, Hydrogen. • **Rocks** contain Iron, copper, calcium carbonate, andother minerals like iron,Gold, Cobalt. • **Trees and natural vegetation** is made up of carbon,hydrogen, oxygen atoms
Impact of human activity onthe natural resource **how it occurs / chemicals and physical reactions** **+ MITIGATION**	• **Crop husbandry**; fertilizers and manure are used which pollutes water bodies and make them unsa for use. This can be mitigated by sensitize framers to use controlled doses of fertilizers and manure i gardens/use organic fertilizers. • **Crop/animal husbandry;** trees and other vegetatior are cut down to create space; water cycle is disrupted-hence, less rainfall is received. This can be mitigated by planting trees that grow and mature fast. • **Crop/animal husbandry;** trees and other vegetation are cut down to create space; carbon dioxide accumulates in the atmosphere-hence, global temperature rises and rainfall formation reduces. This can be mitigated by planting trees that grow and mature fast. • **Brick making** involves clearing the swamps/vegetation to create space and cutting down trees to burn the bricks; this causes destruction of vegetation, soil degradation and decrease in ground water levels. This can be **mitigated by planting trees that grow and mature**

	• **During the burning of bricks**, a lot of carbon dioxide and black carbon are released into the atmosphere; This can be mitigated by planting trees that grow and mature fast/pit refilling/strict laws against brick making/using modern and less harmful methods etc. • **Sand mining** involves extraction of sand by use of sand pit/open pit for other uses; this results into contamination of local streams and wet lands/salination of aquifers/disruption of the ground water levels. This can be mitigated by land reclamation of quarried areas/land refilling of quarried areas/putting in strict laws against sand mining.
enefit of the atural resource	➢ Air - facilitates respiration, during respiration carbohydrates combine with oxygen in order to release energy and carbon dioxide used for properbody functioning. - facilitates photosynthesis. During photosynthesis, carbon dioxide from air combines with water in presence of sunlight trapped by chlorophyll to formglucose, carbohydrates and oxygen. ➢ **Water** - **habitat** for many aquatic organisms; water bodieslike lakes, dams, pools contain necessary conditionsfor survival of aquatic animals -**Water from the water bodies** evaporates and eventually cools and condenses on the clouds, theseresults into precipitation. -**Water bodies** like rivers can be used to generate electricity, fast moving waters to the rivers drives turbines at waterfalls which produce kinetic energyinto electrical energy • **Water bodies** provide water for irrigation; this helps to cool crops and makes them to grow healthy and hence, boast food production. • **Water bodies** provide water for drinking; this helps to cool our bodies and dissolve the food we eat, and get rid of the wastes through urination. • **Forests/trees** provide us with oxygen; during photosynthesis oxygen is released and can be used during respiration. • **Forests/trees** reduce greenhouse effect; since they use carbon dioxide during photosynthesis and oxygen which can be used during respiration is released. • **Sand is used** for construction of houses; sand is mixed with cement and applied to firmly bind bricks together

SCENARIO

A scenario is a set of information that a learner needs in order to mobilise his or her learning (knowledge, skills and values) to solve a real-life problem / task/challenge. In this, a problem or realistic or hypothetical situation is presented to a test taker to see if the test taker can mobilise resources and tackle a real-life challenge.

Tools of communication

- ✓ Letter
- ✓ Speech
- ✓ Report
- ✓ Leaflet
- ✓ Write-up
- ✓ Live videos

DELINES TO ITEM TAKERS (Candidates)

emistry subject has two papers at the end of the cycle. These paper one(theory) and paper two (practical)
this book our concentration is on theory.
e theory paper chemistry 545/1 consists of two sections, A and it has six examination items.

ection A has two compulsory items.
he two scenario items require **fill in responses** from the item ker. And these come from **2nd element** of **construct** and **3rd ement of construct** for items **1** and **2.** These can be terchanged depending on item writer of the day.

ection B has **two** parts; **I** and **II.**
t has four scenario items that require **extended responses** from the item taker.
A candidate is supposed to answer one item from each part.
tems from part **I** (item **3** and **4**) are from the **1st element** of **construct** while those from part **II** (item **5** and **6**) are from **4th** element of construct. These can be interchanged depending on item writer of the day.

Duration of the paper is **2hours.**
Total score will be **60.**

TYPICAL EXAMINATION PAPER SERIES

SET ONE

SECTION A

Answer **all** the items in this section.

1. The laundry department of a new cleaning service unit in one village where they use spring water has failed to raise profits inthe project. They use too much of the detergent during the washing process. Their manager keeps purchasing the same detergent, and still no change. They keep making loses and are frustrated.

Tasks;

(a) As a chemistry student, guide the branch manager to understand the problems he makes while choosing the product.

(02 scores)

The problem is that he choose soapless detergents like barsoap instead of choosing soapless detergents which is more effective in hard water ie liquidsoap.

The bank manager should use soapless detergents instead of soapy detergents which are less effective in hard water.

(b) Help him to understand how the product works. (02 s

Soap molecules contains two parts mainly. 02

The hydrophilic part which loves water but hates oil

and hydrophobic part which loves oil but hates wate

During washing, the surface tension between water and

dirt is lowered.

With constant agitation, the dirt removed off the cloth.

(c) Advise on the challenges associated with long term use of product.

- Soap molecules contains chemicals that cause skin burn hence pain and this can be mitigated by thoroughly washing the affected part. (04 scor
- Soap causes eye redness and pain hence lose of vision and can be mitigated by thoroughly washing the affected area with clean water.

2. A business lady owns a flower farm in ADUK village i Uganda. She is in the process of searching for quality plasti boots that are environmentally friendly. There are various boots of different quality and composition in the nearby shops. However, she does not know the quality of the boots to purchase.

owever, the business lady knows that quality boots depend on e nature material and here she comes for some advice from ou.

ask;

s a chemistry student,

a) Explain

(i) Category of the product. **(02 scores)**

Natural materials exciston nature natural for example wool, cotton, rubber

Synthetic materials made by man for example Nylon, polythene.

(ii) The suitability of the product. **(02 scores)**

Natural rubber is soft

Natural rubber is sticky

Natural rubber has low tensile strength

Natural rubber is durable.

(iii) Advise her on the choice of the product she should go

(04

Use of the products ??

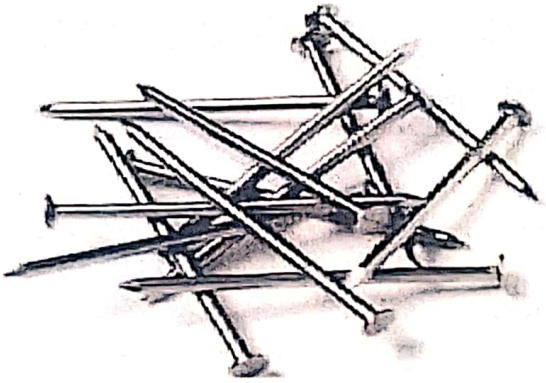
- They produce toxic fumes when burn in air hence suffocation to living organisms, It can be mitigated by recycling.
- They can cause land pollution after use ie they don't allow water to go through the soil, It can be mitigated by proper disposal of wastes

SECTION B

Part I

Answer **one** item from this part.

3. **Uganda Builders' Forum** raised a concern of high rever imposed on imported iron nails to parliament of Uganda. T government of Uganda has provided some land in Toro district to an investor as an alternative to set up an ir extraction plant However, the community is concerned abo its environmental effects and how the process will occur. Som are protesting the proposal that there is no importance of th plant to them. This is the talk of the town where your school i located.



ıe new president of chemistry club has appointed you to ınsitize the other learners.

ısks;

s a chemistry student, prepare a write up you will use during the lenary. **(11 scores)**

ıovernment has contracted a local investor to expand the bridge on Karuma falls in bid to reduce accidents on that bridge. The engineering team has quoted a huge bill on bags of cement required for the construction process.

ln a management meeting, the investor has suggested to set up a cement producing plant with minimal environmental hazards. Residents are against the idea claiming that there is no importance of the plant to them.

The editor of a national newspaper is a member of the community and wishes to publish an article on the matters raised.

He has visited your school. You have been selected to represe
the chemistry club.

Task

As a chemistry student, make an article that will be used in
publication to sensitize the community. (11 sco

[Use the booklet below to respond to items in section B – Part

No.3 EXTRACTION OF IRON.

Raw materials

Haemitite ✓fun Limestone ✓fun (02)

Hot air Coke ✓fun

Process of production

- Haemitite, ~~lime stone~~ ✓fun and coke are fed into a blast (03)
furnace from the top.
- Hot air is blown from the bottom of the blast furnace ✓
Coke is oxidized by hot air forming Carbondioxide
Ch
Carbondioxide formed reacts with excess coke reducing ✓P
to Carbonmonoxide. Carbonmoxide reduces Haemitite
to ✓Cd molten iron and carbondioxide is given off.
Lime stone decomposes to Calciumoxide and Carbondioxide ✓P
Calcium oxide formed reacts with silicondioxide forming
Calcium silicate which is tapped off

Side effect and Mitigation (03)

Hot surfaces burn causing wounds hence pain to workers

and this can be mitigated by using required personal protective Equipments.

Social benefit of the process.

Employment opportunity, Increased Income to the residents hence Improved standards of living (03)

SECTION B
PART II

Attempt one item from this part.

5. In the Albert region of western Uganda, extraction of petroleum and natural gas is due to commence. The area is traditionally known for fishing, crop husbandry and animal husbandry and part of it covers a national park. Many trees havebeen cut to clear land for the project.

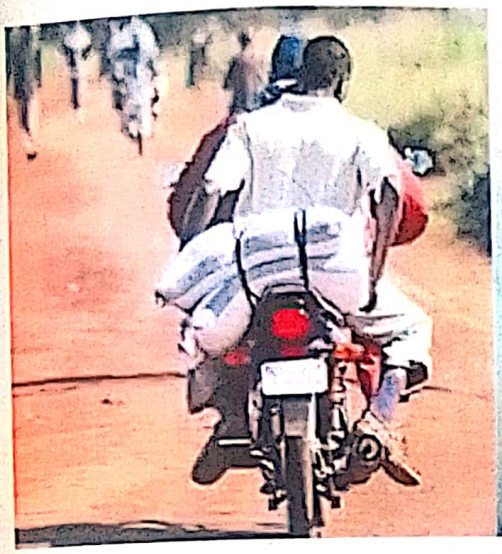
The community is concerned that the operations of oil and gas extraction are going to interfere with the traditional activities of the area, displacement of people and others expect some environmental effects.

Task;

Using the knowledge of chemistry, you have attained, guide the community chairperson on his way to the annual community meeting on the above operations. **(11 scores)**

6. In Namutumba Sub County, most of the youth ride motorcycles(boda boda) as their source of income and the burn petrol. Their wives use charcoal as the main fuel for cooking. The community factory uses diesel in their generators as their main source of a fuel.

These happenings have left many of the residents wondering why



he area member of parliament has organized a sensitization orkshop with a theme 'MY ENVIRONMENT MATTERS' to explain he existing situation to the community.

ask;

As a chemistry student, write a message you will display upon invitation. **(11 scores)**

Use the booklet below to respond to items in section B – Part II]

Item 5:

GUIDE TO THE COMMUNITY CHAIRPERSON ON HIS WAY TO THE ANNUAL COMMUNITY MEETING:

Environment is the surroundings of man. It has natural resources which is categorized into two categories namely

- Renewable natural resources, these resources can be replenished for example plants, air.
- Non-renewable natural resources are resources which can not be replenished like Natural gas and petroleum.
- fossil fuels (petroleum and natural gas) is composed

Carbon and Hydrogen. (02)

Impact of the human activity on the natural resources.

- Animal husbandary, trees and some other Vegetation are cut down to create space, water cycle is disrupted hence less rainfall is recieved and this can be mitigated by planting trees that mature fast.

Benefit of the Natural resources.

- Trees provide us with oxygen, during photosynthesis oxygen is released and be used by living organisms during respiration.
- Trees reduce on greenhouse gases since they use Carbon dioxide during photosynthesis and oxygen gas is released to be used by living organisms.

SET TWO

SECTION A

Answer **two** items from this part.

. Okuma was feeling some headache on his way from school. He omplained to his uncle Mr. Musoke. He gave him a treptomycin since they were the only available tablets in his upboard. He rested for few hours. On waking up, the headache vas beyond. The uncle was restless and thought of giving more ablets to the boy.

Task

As a chemistry learner,

a) Cite out the problem Mr. Okuma made when choosing the product. **(02 scores)**

Mr. Okuma used antibiotics medicine instead of analgesic

b) Guide Mr. Okuma to understand how the product works. **(02 scores)**

c) Advise him on the challenges associated with the long use of the product. (04

2. Most farmers in Luwero District have been are using manu in their fields. The District Agricultural Officer (**D.A.O**) in a rec workshop advised them to use fertilizers in their fields as one the ways of increasing yield per acre. Nitrogen nutrients are k for maize to grow well. He added.

A new Agricultural store in the district sells fertilizers in sacks **and B**. Sack **A** consisting of Ammonium nitrate while sack **B** consists of Ammonium sulphate

Where necessary use **[N=14, O=16, H=1, C=12, S=32].**

Mr. Mugasi, a known maize farmer is planning to switch from us manure to one of the brands on market. He has contacted you because he hasheard that you have attained some knowledge i chemistry.

Task;

(a) Explain

(i) category of the product. ***(03 score***

(ii) the suitability of the product. **(03 scores)**

(b) Advise him on the choice of the product he should go for.
(04 scores)

SECTION B
PART I

Answer **two** items from this part.

3. Uganda builders' forum raised a concern of high re
imposed on the imported iron nails. Government has clear
investor to set up an iron and steel production plant in T
district. However, the community is concerned abou
environmental effects and how the environmental process w
Residents are protesting the establishment of the plant in
locality claiming that the plant is not important to them.

You have been appointed by the president of the science club
represent your school in the forthcoming forum workshop with
the community.

Task

Prepare a presentation you will make during the workshop.

(11 scores)

4. Wang swung Uganda is a company that imports Aluminum t
manufacture aluminum door flames. The management is
frustrated with the high revenue imposed. In response, the
operations manager has cleared an Aluminum extraction unit
Yumbe district which is rich of aluminum deposits.
Unfortunately, the residents are concerned about the

environmental effects of the process and are inquisitive whether it is going to be beneficial to them.

As part of the community, the manager has contacted you to guide him on what he is about to deliver to the community in the incoming community meeting.

Task

Prepare a report that will guide him on his presentation.

(11 scores)

[Use the booklet below to respond to items in section B – Part I]

SECTION B

Part II

Answer **one** item from this part.

. Jumaya is a rocky village in Mitoma district, western Uganda. Most youth in this region make bricks and cut down the trees to urn them in the kilns as their source of income. Their wives work stone quarries to raise school fees while their children are volved in cattle keeping. Recently, there is low water level in the ommunity and the little available in some wells is dirty. Residents re frustrated and do not know what to do.

The members of district environment committee are planning to reate an awareness message to the residents through a workshop. You have been invited to be part of the workshop.

Task;

As a chemistry student, make a write up you will display upon invitation. **(11 scores)**

6. 90% of men in Buntaba a rocky village in Mukono district practice charcoal burning and crop husbandry as their main activities. Their wives are involved in stone quarrying.

Of late their crops have started drying out.

Recently, there is low water in the community and the available in some wells is dirty. Residents are worried and raised their concerns to the chairman of the village .

The members of village environmental conservation unit are planning to create an awareness message to the residents through a community workshop.

Task;

As a chemistry student, make a write up you will display invitation. **(11 sc**

[Use the booklet below to respond to items in section B – Pa

SET THREE

SECTION A

Answer **all** items from this part.

1. Sarah was running in a compound and accidentally stepped into a hole. She cried endlessly as she was feeling a lot of pain. Maria, her friend, gave her some garlic extract medicine and after a few hours of rest, her leg was still paining her. She complained to her auntie who gave her paracetamol and in a short time, she got relieved.

Task

As a chemistry learner,

a) Point out the problem Sarah made when selecting theproduct.

(02 scores)

b) Guide Sarah on how the product works. **(02 scores)**

c) Explain the challenges associated with continuoususe of the product.

(02 scores)

d) Help her to make an evaluation on the products.

(02 scores)

Sodium chloride is a table salt used by many Ugandans. In their project on environmental management, 3 boys of Wakatayi Primary School are curious to know the structure, composition and properties of the crystals of this table salt. However, one of the boys claims that the crystals can do more harm than good when exposed in their environment.

The boys have to come to you for some advice.

Task;

As a chemistry student;

(a) Explain;

(i) Category of the product. **(03 score**

(ii) Likely properties of the product. **(03 scores)**

(b) Help to guide them on the uses of the product. **(02 scores)**

(c) Settle the boy's worries on whether the product is environmentally friendly or not. **(02 scores)**

SECTION B
PART ONE

Answer **one** item from this part.

. The soap production unit of one group of industries in Uganda ıses Sodium hydroxide as the chief raw material in soap roduction. To ensure that Sodium hydroxide is readily available ınd at a cheaper cost, the company is planning to set up Sodium ıydroxide production plant near Lake Katwe in Kasese region. Unfortunately, the residents have raised concerns about its ənvironmental effects and how they will socially benefit from the proposal.

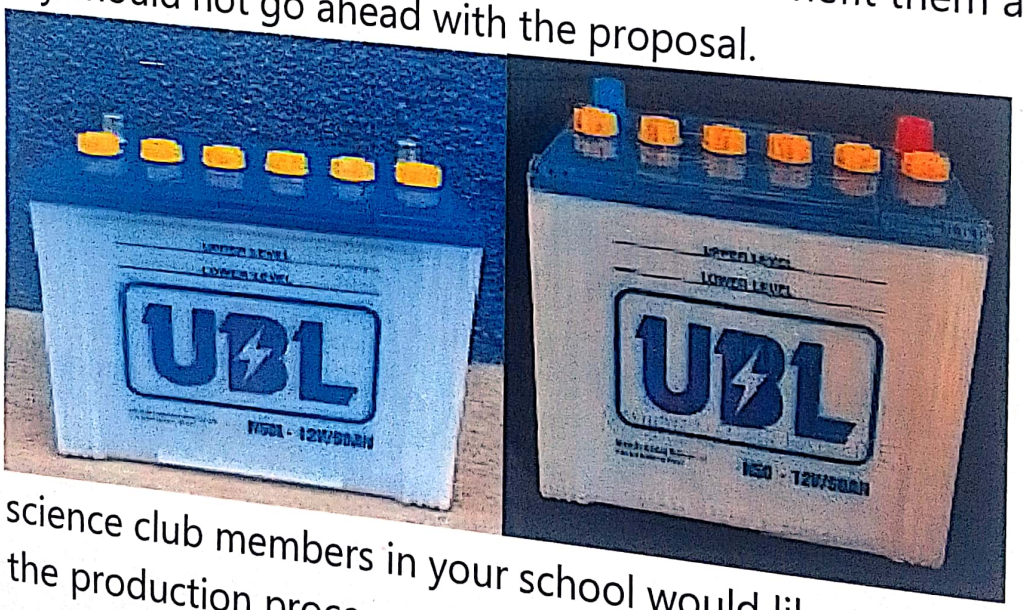
A team of five students have been appointed from your school to attend the community workshop.

Task:

Prepare a presentation you will make during the workshop, as the leader of the team.

(11 scores

4. Uganda Battery Limited (UBL) uses Sulphuric acid as the main electrolyte in their batteries. In a bid to cut the costs on importing the acid, the management has contracted a production unit to set up a sulphuric acid production plant near Kilembe mines in Kasese region. The community is not convinced about its likely environmental impacts and how the environmental process will be achieved. Some claim that the plant will not benefit them at all So, they should not go ahead with the proposal.



The science club members in your school would like to know the how the production process will be carried out. They are seeking for your guidance before the school assembly is held.

Task;

As a chemistry learner, make a write up you will use during the presentation while addressing the assembly.

(11 scores)

[Use the booklet below to respond to items in section B – Part I]

Author_ Kibugo Dennis

SECTION B
PART TWO

Answer **one** item from this part.

5. Kitubuulu village, Entebbe, Wakiso district is located on the shores of Lake Victoria. Most of the men are fish mongers and ladies practice weaving for commercial purposes and these get their raw materials from the nearby forests. Recently residents ar complaining to the chairman over industrial wastes released directly into the lake by a new factory. Fish has reduced. All these have left local authorities worried.

A sensitization workshop is to be organized to explain the existing situation in the village. The theme of the workshop is **"VICTORIA, MY LAKE "**

Task;

Using the knowledge of chemistry, you have acquired, make a *write up* you will display upon invitation in this workshop.

(11 scores)

6. In *Mutamba sub* county, there is a new trending design in house construction by many of the youths. This involves use of

stones to construct the walls of the buildings. Stone quarrying is the order of the day. The springs which are the only available water source have started producing dirty water and this is worrying the residents. And many have raised their complaints to the LC3 chairperson of the sub county.

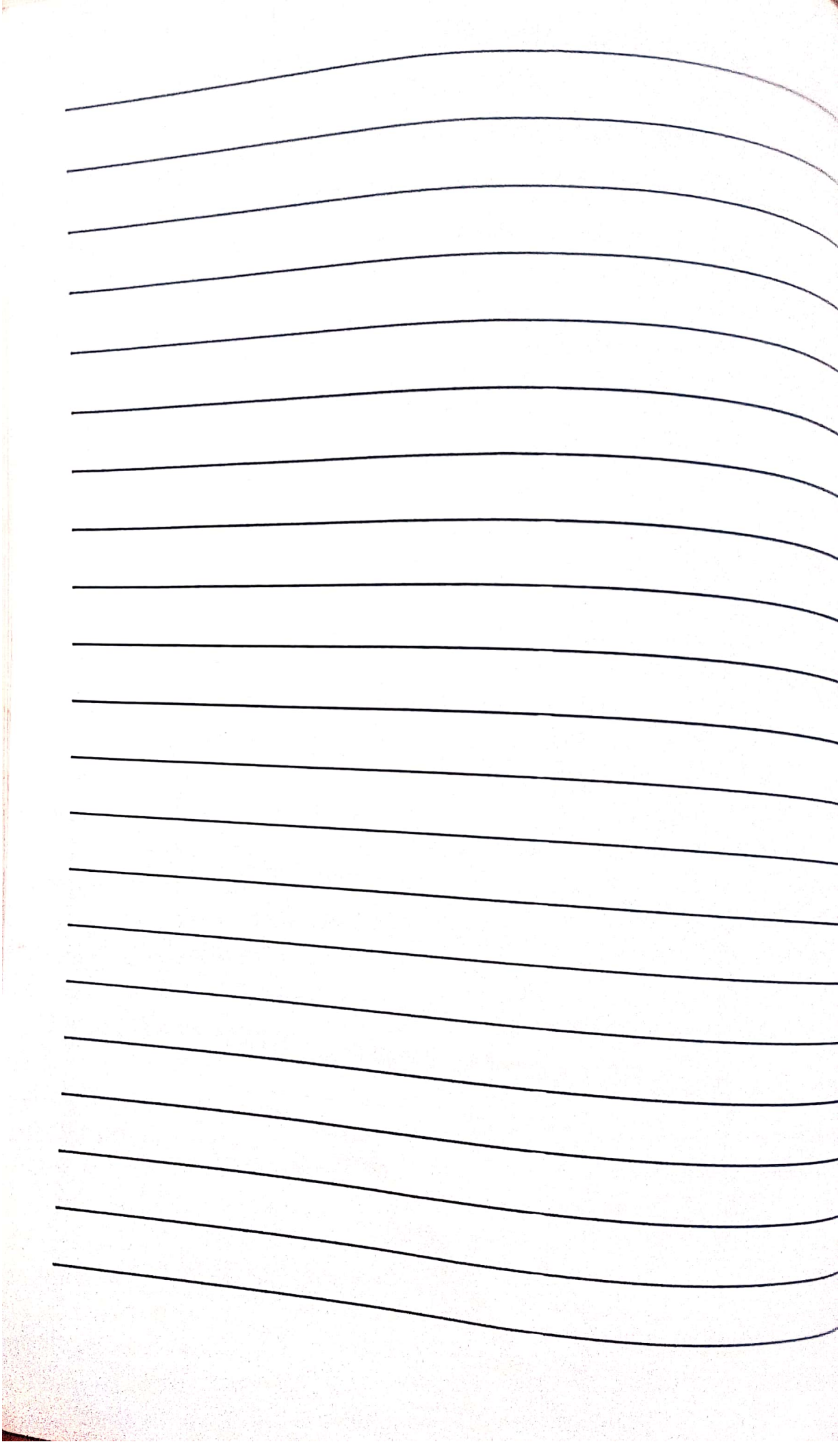
he chairman has organized a sensitization workshop to explain he ongoing situation in the village. The theme of the workshop is **SAFE WATER IN MUTAMBA"**

ask;

Using the knowledge of chemistry, you have acquired, make a write up you will display upon invitation in this workshop.

(11 scores)

[Use the booklet below to respond to items in section B – Part II]



SET FOUR

SECTION A

Answer **all** items from this part.

After digging a trench, Okopa felt some pain in the hand muscles. He went to a nearby bush and got some leaves of one plant. Using water, he prepared an extract from the leaves. He took some and bathed the rest. Four hours later, the pain was still too much and was frustrated. He later visited a drug shop and was given codeine tablets and got relieved in a short time.

Task

Using the knowledge of chemistry, you have attained

a) Cite out the problem Okopa made when choosing the product.

(02 scores)

b) Help him to understand how the product functions.

(02 scores).

c) Advise him on the likely challenges he will get for continuous use of the product. (02

d) Guide him to evaluate the products. (02 sc

2. The Ministry of Energy and Mineral development, has discovered some traces of sodium in Karamojong regions of North Eastern Uganda.
Residents have heard about the information are curious to know its composition and properties.

he area Member of Parliament has organized a sensitization orkshop to be guided on environmental concerns of this roduct. You have been contacted to give some views as hemistry student.

ask;

Using the knowledge of chemistry, you have attained

a) Explain;

(i) Category of the product. **(03 scores)**

(ii) Likely properties of the product. **(03 scores)**

(b) Help to guide them on the uses of leaves product. (02 sco

(c) Settle their worries on whether the product is environmenta friendly or not.

SECTION B
PART ONE

Answer **one** item from this part.

3. Ethanol is one of the main raw material in the manufacture of sanitizers. Due to the wide spread of red eye illness in schools, there is an increased demand for the sanitizers among the school proprietors. Government is facing a problem of low supply of sanitizers and is planning to set up an ethanol production plant with minimal environmental impact. The locals are doubting its impact to their well-being.

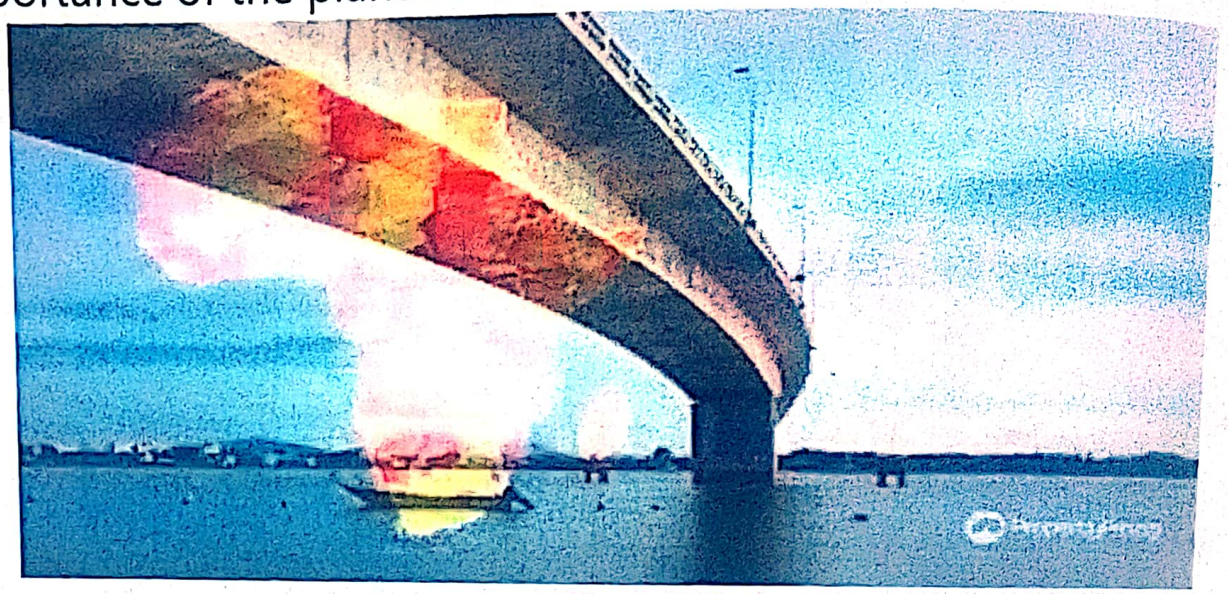
production team has organised a workshop on how the process of production occur. You have been selected to sensitise fellow students on an assembly.

sk; As a learner of chemistry, make a write up you will use before the enary. **(11 scores)**

4. Government has contracted a local investor to expand the bridge on Karuma falls in bid to reduce accidents on that bridge. The engineering team has quo ted a huge bill on bags of cement required for the construction process.

In a management meeting, the investor has suggested to set up a cement producing plant with minimal environmental hazards.

Residents are against the idea claiming that there is n importance of the plant to them.



The editor of a national newspaper is a member of the community and wishes to publish an article on the matters raised. He has visited your school. You have been selected to represent the chemistry club.

Task

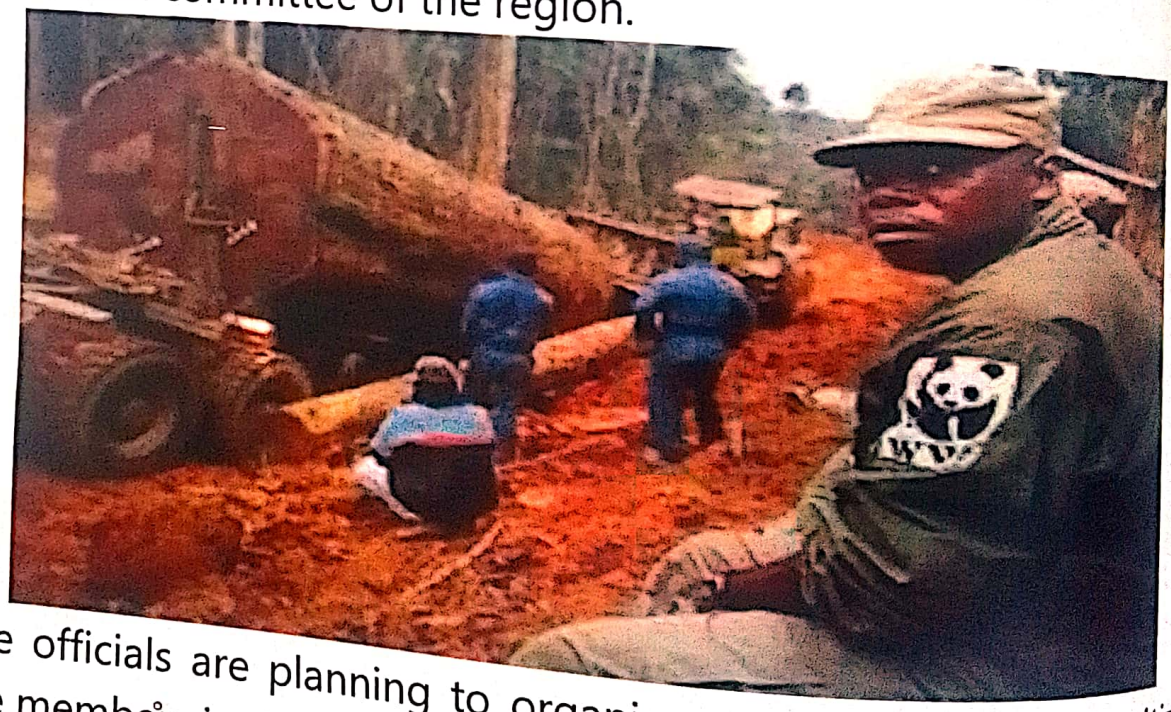
As a chemistry student, make an article you will that will be used in the publication to sensitize the community. (11 scores)

[Use the booklet below to respond to items in section B – Part I]

SECTION B
PART TWO

Answer **one** item from this part.

5. Many factories have mushroomed in Matuga areas along Bombo Road producing toxic fumes to the environment. There an increase in population due to many people coming to the region for employment opportunities in the factories. Much of vegetation is being cut while clearing land for construction of their buildings. Recently, the wells have dried up and the little water is not fresh. Drought conditions have started sprouting u in the region. All these have left many of the residents wonderi why. This has attracted the attention of the environmental protection committee of the region.



The officials are planning to organize a workshop and sensitiz the members in the region over the matter.

Task

As a chemistry learner, make a write up you will use to present upon invitation.

(11 scores)

Lutete village in Luwero district is developing at a fast p
here are many shops, primary schools and markets that
een put in place. Many swamps and forests are now filled
uildings. Recently the wells are drying up and yet the little
hat is available is not fresh. The few that practice crop husb
lso say that seasons have changed and this has caused fam
he area Theses happenings have left many wondering why

A sensitization workshop is to be organised by the gc
through National Environmental Management Authority

Task;

As a learner of chemistry, present your message upon i

[Use the booklet below to respond to items in sectio