

S.4 CHEMISTRY FACILITATION

Subject code: **545**

Number of papers :2

Paper 1 : Theory -**545/1**

Paper 2: Practical -**545/2 or 545/3**

Note : Candidates are assessed basing on **KUSVA** (Knowledge, Understanding, Skills and Attitudes/Values)

CHEMISTRY PAPER 1 545/1

Format of the paper

- All items are scenario based
- It's a theory paper of duration 2 hours
- Its composed of two sections A and B
- Section A has 2 compulsory items
- Section B has 4 items
- You attempt four questions in total – 2 from each section

Section A

- Comprises of two items in broken tasks
- Both items are compulsory
- This section emphasizes knowledge and values
- Responses are written in spaces provided

Areas of assessment

There are three main areas on which assessment in section A are based

Area 1 – Category

Area 2 – Suitability (what makes the substance good)

Area 3 – Advice (based on similarity/ difference /impact)

However, each item is constructed from a different element of construct, has a unique approach and comes from specific topics

ITEM 1 ;Appreciates the application of chemistry in daily life

		Category
CHEMICALS FOR CONSUMERS		
	(i)Food additives	Source , Natural and Synthetic
		Also Function – Preservatives, Anti-oxidants, sweeteners, Thickeners, Flavorings, etc
	(ii)Medicines	Source – Modern and Traditional
		Also function - Analgesics, Antibiotics and Psychotherapeutics(for mental disorders)
	(iii)Detergents	Soapy and Soap less
NUCLAER PROCESSES		Nuclear fission and Nuclear fusion

APPROACH TO SECTION A, ITEM 1

- 1) Identify the product and category /type of the product
 - Give **one** category of the product
- 2) Give the function of the product(s) or describe how the product works
 - Write an **elaborate description** to capture all keywords
- 3) Give one danger/side effect of the product/process, explain the danger and mitigate it
 - Follow **DEM** i.e. **D-Danger, E-Effect, M-Mitigation**
- 4) Evaluate the product/process based on similarities and differences
 - Give **one** similarity and one difference

SAMPLE QUESTIONS

WENSSEC ITEM 1 FOOD ADDITIVES

Allen and Stella are co-wives who are given the same amount of money by their husband for meals. One day, the two wives were given beef to be cooked on the same day. However, on tasting the sauces from the two wives, Stella's food was preferred to that of Allen as it tasted nicer and had good aroma . this has frustrated Allen who has approached you for help. However, Stella testified that besides other ingredients she normally adds Royco which she purchases from a nearby shop.



Task;

As a chemistry learner,

- a) Identify the category of ingredients the two used to prepare their food

The ingredients used can be Natural or Synthetic food additives. ie Food enhancers, Sweeteners, Anti-oxidants, Food preservatives etc.

b) Explain how the ingredients added made the food delicious.

Food enhancers like Rocycos boost food flavours

Food preservatives, increase the shelf life of food

Sweeteners, add sweetness to food

Anti-oxidants, prevent food from being oxidized/going bad

Food colours, add colour/better appearance to the food

(any four are required)

c) Guide the two ladies on the dangers associated with the long term use of the ingredients

Some food additives contain chemicals that are agents to organ cancer , allergic reactions and digestive disorders , this can be mitigated through limiting their use

d) Explain to Allen why Stella's food was preferred.

WAKISSHA ITEM 1 2025 MEDICINES

Two children studying in a boarding school came home for holidays, They spent the following day with their parents working at the farm. In the evening the children felt headache and their father took them to the clinic where they were given tablets. On reaching home, the elder one took the tablets but the young feared and decided to mix lemon juice and ginger extract on hot water and took a cup, after a few hours the young one still complained that there was little relief and wondered why and has come to you for help.

Task

As a chemistry student,

- a) Help the children to understand how the nature of the products suit their work.

**The elder brother used tablets, modern medicine and the young brother used Traditional medicine, they are analgesics
Analgesics work by reducing/blocking pain signals in the nervous system thereby inhibiting pain in the body i.e. the headache**

- b) Explain what would happen to the elder child after using the tablets for a long period of time

The analgesics cause a range of side effects like nausea, vomiting, dry mouth etc. on prolonged use, this can be mitigated by using recommended doses

- c) Explain to the children why the process of healing was not the same

Both are pain killers

However, The young brother used herbal medicine which are less effective compared to the modern medicine used by the elder brother

HOIMA DIOCESE MOCK ITEM 1 2025 DETERGENTS

Detergents remove dirt and stains during washing clothes. They come in different categories, each made to handle different types of dirt during washing. At a recent family function, guests were amazed by how clean and fresh the tablecloths and seat covers looked, the spokesperson proudly said, 'that's the power of chemistry' One lady, curious about the comment, wanted to know how detergents work. She also wanted to understand how to choose the right type for proper cleaning and environmental safety.

Task

As a student of chemistry

- a) Help
(i) The lady to know the categories of the products the spokesperson talked about.

Detergents are categorized into two i.e. Soapy and Soap less detergents

- (ii) The lady to know how the products worked on the cloths

Detergents molecules contain two parts namely, the hydrophilic part(loves water but hates dirt) and hydrophobic part(loves dirt but hates water). During washing, the surface tension between water and oil/dirt is lowered. With continuous agitation, the dirt is removed off the cloth

b) Advise her on;

(i) The possible problems associated with the products

Soapy detergents contain chemicals that can cause eye redness and hence leading to loss of vision and pain. This can be mitigated through thoroughly washing the affected areas on the body

(ii) How to make choice of the product when needed.

Both soapy and soap less detergents are effective in soft water

However soapy detergents form scum with hard water while soap less detergents do not form scum with hard water

ITEM 1, NUCLEAR PROCESSES

On 13th June 2025 Israel launched a missile attack targeting a heavy nuclear plant of Iran. The plant plays a vital role for Iranians especially acting as their main source of energy for production of electricity which involves the splitting of unstable radioactive nuclide such as Uranium according to the equation below



The international nuclear agencies of Iran are concerned about the consequences of the plant to the people in that area if it explodes. You have been invited as the senior Nuclear Reactor Operator (NRO) to enlighten the news reporters about the operation of the plant.

Task

As a learner of chemistry

a) Explain

- i) the category of the process involved in the plant

The process involved is Nuclear fission

- ii) how the process is used to produce energy in the nuclear reactor.

When Uranium is bombarded with fast moving neutrons its atomic mass increases and the nucleus becomes unstable. Therefore it spontaneously splits into two lighter nuclei i.e. Krypton-92 and Barium-141 , three neutrons and energy.

The three neutrons cause more successive disintegration amplifying the energy given out. As seen below



- b) advise them on the challenges associated with a long-term use of the process and how it can be mitigated.

The energy emitted can cause cancer/death of some cells resulting into malfunctioning of some body organs and this eventually can lead to death of the victim, this can be mitigated by wearing protective gears such as lead coats

- c) compare the processes which can involve in the production energy.

Another process that can evolve energy is Nuclear fusion

Both Nuclear fission and nuclear fusion produce energy

However , Nuclear fission produces more energy than Nuclear Fusion

ITEM 2 OF SECTION A

ITEM 2; appreciates the diversity and interactions of substances and their importance in life

Approach

- 1) Identify the category of elements/compounds/substances/materials with reason (definition or fact) and give one example – related to the problem in the scenario
- 2) Outline at least four properties/x-tics for the elements/compounds/substances/materials
- 3) Give one use of the elements/compounds/substances/materials identified
- 4) State one impact of the elements/compounds/substances/materials identified and write one suitable mitigation

ITEM 2 TOPICS

- Elements, compounds and mixtures
- The periodic table
- Trends in the periodic table
- Structure and bonding
- Formulae, stoichiometry and mole concept
- Using materials
- Carbon in life- hydrocarbons, polymers
- Reactivity series – alloys
- Polymers and plastics
- Air – rusting and combustion
- Biogas
- Fertilizers

JJEB 2025 ITEM 2

During a scientific investigation members of S.3 heated 2.52g of calcium in excess oxygen to form 3.52g of an oxide. However, the learners found challenges establishing the formula of the substance formed since they lack some information about it even after being given the atomic masses of calcium as 40, oxygen 16 and molecular mass of the oxide as 56g.

Support material:



Task

As a learner of chemistry, advise the student of s.3 on

- i) Category of the substance formed

Calcium oxide is an ionic compound because it is formed by combination of a metal and non-metal
OR it's a basic oxide because it dissolves in water to form an alkaline solution

- ii) Properties of the substance and one use

It dissolves in water
It conducts electricity when in molten or aqueous solution
It is a solid at room temperature
Has high melting and boiling points

USE, its used to neutralize acidic soils in agriculture

iii) Determine the formula of the oxide formed

Element	Ca 2.52	O 1.00
Composition	$\frac{2.52}{40} = 0.063$	$\frac{1.00}{16} = 0.063$
Moles	$\frac{0.063}{0.063}$	$\frac{0.063}{0.063}$
Mole ratio	1	1

Empirical formula CaO

$$(CaO)_n = 56$$

$$40 + 16n = 56$$

$$56n = 56$$

$$n = 1$$

Molecular formula is CaO

SECTION B ITEM 3 & 4 – INDUSTRIAL PROCESSES

Appreciates the contribution of chemistry to our economy

Assessable areas

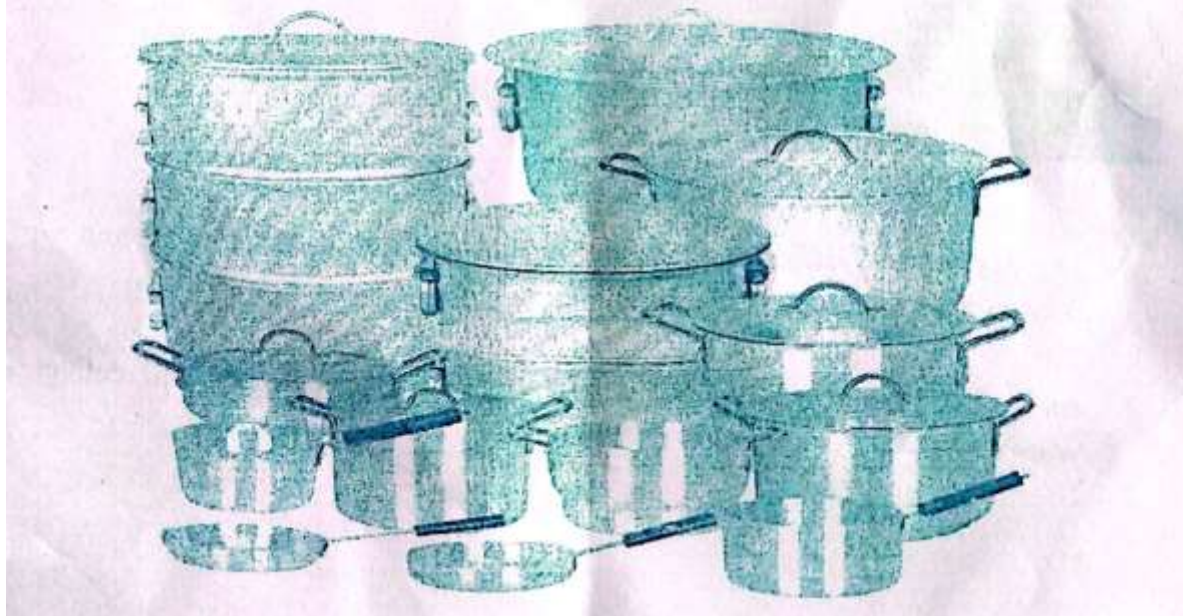
- 1) Manufacture of;
 - Chlorine
 - sodium hydroxide
 - Cement, lime
 - Nitrate fertilizers or nitrogen-based fertilizers
 - Ethanol
 - Biogas
 - Oxygen
 - Detergents- soapy and soap less
 - Sulphuric acid
 - Nitric acid
- 2) Extraction of metals i.e. Iron, Aluminum and Copper
 - **Also**; obtaining useful products from crude oil
 - Water treatment process

Basis of assessment

- i) Raw materials
- ii) Process of production
 - Vessel, V
 - Chemical process, Cp
 - Conversion to the desired product
 - Coherence, Ch
 - Purification, Pr
- iii) Side effects of the process and purification
- iv) Social benefits

UTEC 2025 PART 1 ITEM 4

Aluminium is very vital in the production of various commodities including kitchen utensils, television aerials, and satellite dishes. Due to shortage of aluminium products and the poor quality of products, the government has contracted an investor to set up a plant for aluminium extraction with less environmental impacts. The investor would like to know how the process of production would be carried out



You have selected by your headteacher to give the necessary information to the investor about the establishment of the aluminum plant

Task

As a chemistry learner, prepare a write up you would present to the investor

Extraction of aluminium.

Process of production.

Extraction of aluminum from bauxite involves two stages mainly:

i. Purification of the ore.

- Bauxite is ground to powder, then heated to convert iron(II) oxide to iron(III) oxide and to drive off water of crystallization
- The residue is crushed into fine powder then boiled with concentrated sodium hydroxide solution in a concentration tank to form sodium aluminate and sodium silicate.

Equations.....

- The undissolved impurities are filtered off.
- Carbon dioxide gas is bubbled through the filtrate to precipitate out aluminum hydroxide leaving behind sodium silicate in solution.

Equation.....

- The aluminum hydroxide produced is then filtrated off, washed, dried and heated strongly to form aluminum oxide and water.

Equation.....

ii. Electrolysis of aluminium oxide.

- The process of electrolysis is carried out in a cell, using carbon electrodes and molten cryolite has the electrolyte
- Aluminum oxide is dissolved into molten cryolite to lower its melting point.
- Aluminum oxide is decomposed by electric current producing aluminum ions and oxide ions in the solution.
- Oxygen is given off the anode
- Aluminum is obtained at the cathode.

Equation

Side effects of the production process.

- Emission of greenhouse gases from the industry such as carbon dioxide and PFCs which results to global warming, famine and drought in the long run. This can be mitigated by fitting catalytic converters in industrial chimneys

Social benefits.

- Source of employment opportunity for the locals. this results to improvement income .thus better standards of living.
- Source of revenue to the government through taxes, thus improves infrastructures like roads, health facilities resulting into better standards of living by the locals. (only one well explained)

SECTION B PART 11, ITEM 4 & 5 – NATURAL RESOURCES

Appreciates the existence of natural resources in the environment and their importance in daily life

NATURAL RESOURCES

- Air
- Water
- Rocks and minerals
- Fossil fuels
- Trees/vegetation
- Carbon based fuels

TYPE/CATEGORY	REASON	EXAMPLE
Renewable Natural resources	Are materials whose use by man doesn't deplete the resources and can be replaced naturally	Air, water, forests, charcoal and wood
Nonrenewable resources	Are materials whose use by man depletes the resources and cannot be replaced naturally	Crude oil, rocks and minerals

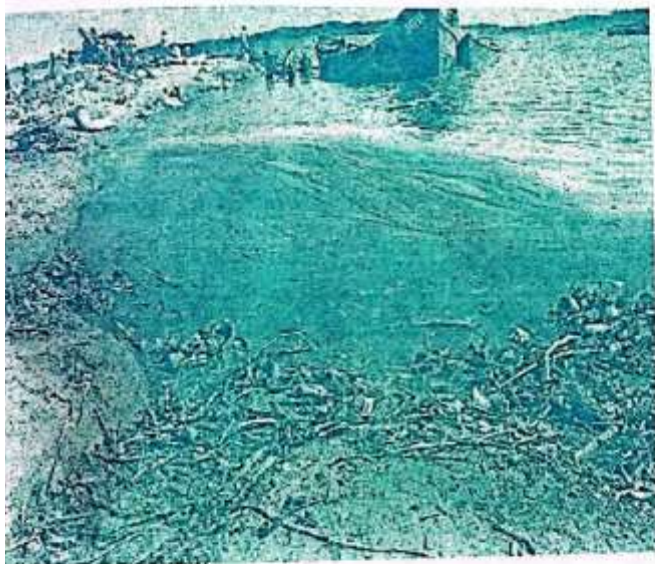
EXPECTED RESPONSES

- 1) Categorize one example of a natural resource (with reason) and give its components/composition. Summarized as **CRE + Cp** i.e.- Category, R- Reason/Definition, E- Example, Cp- Composition
- 2) Describe one human activity from the scenario that endanger the natural resource/ environment. i.e. give one impact, describe how it occurs and how it affects the resource(environment) and how the effect can be mitigated
- 3) Explain one benefit/impact of the natural resources

NOTE; Keep in line with scenario and task

UTEC 2025 PART 11 ITEM 5

“Residents of Jinja are suffering severe health risks due to poor water quality” was the headline in one of the local newspapers. The city’s reputation seemed to have been tarnished, and the residents’ health was hanging in balance. Urgent action to raise awareness and clean the natural resource is needed, and the paper continued to state, “Jinja city’s management authority is getting ready to improve the situation following the alarming level.”



Task:

As a chemistry learner who has studied natural resources, prepare a message Jinja city management authority would use in response to the local newspaper to sensitize the community.

Item 6.

Category of natural resource

Water is a renewable natural resource, because can easily be replaced after use

Other examples include(identify renewable resources in the support material only)

Water is composed of hydrogen, oxygen atoms and mineral ions like sodium ions, calcium ions

Impact of exploitation of natural resources by man's activities on the environment.

- **Industrialization, industries release untreated industrial wastes into the water body, resulting into water pollution thus affecting the water quality leading to death of aquatic animals therefore loss of biodiversity. This can be mitigated by treatment of industrial wastes before being released into the water body.**
- **Washing near water bodies promotes water pollution, since some of the washing detergents are non-biodegradable and contain chemicals that alter the water pH, resulting to death of aquatic animals. This can be mitigated by establishing strict laws against washing along the shoreline of the water body.**

Note . (only one is considered)

Benefits of natural resource.

- **Water bodies with *running water* are essential in the generation of hydroelectricity ✓^{Bi} since it is able to drive turbines to generate electricity.**
- **Water bodies are essential during the rain fall formation through the process of evaporation of water vapor into the atmosphere.**

END