

APPROACH TO THE NEW LOWER SECONDARY CURRICULUM

CHEMISTRY PAPER 1

FIRST EDITION 2024

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Preface

My objective in writing this chemistry book was to prepare O'level students for the UCE examinations which compressively covers the modern approach to the new lower secondary curriculum.

The content in this book has been extended considerably to make it suitable for all students at ordinary level.

This workbook has been written in line with the revised chemistry syllabus for the new Lower Secondary Curriculum. The knowledge and skills which have been incorporated are what is partly required to produce a learner who has the competences that are required in the 21st century.

This book provides summary notes on assessable areas for each of the four elements of construct for the chemistry paper 1.

This book also contains a variety of sample examination papers for the learner to widen his/her subject knowledge.

The learner is expected to be able to work as an individual, in pairs and groups according to the nature of the item in order to be able to share learning experiences with their colleagues.

SSEKYANZI RONALD

Acknowledgement

I would like to express my sincere appreciation to all those who worked tirelessly towards the production of this book.

My sincere gratitude goes to my family and friends for supporting all my initiatives both financially and spiritually. Many thanks go to my parents Mr. Kaliisa John Musisi and Mrs. Joan Kaliisa for educating me.

My task has been made possible through my being able to draw on the counsel of the staff of chemistry department of Nakaseke Christian Secondary School. I am indebted to Mr. Mabiike Deo the head of science department Kololo High School and Mr. Otiya Muhammad head of science department NCSS and head chemistry department Mbogo College School Kawempe.

I have been fortunate in receiving once again the guidance from my former teachers Mr. Mulisa Brian and Mr. Basingura Fredrick.

My work has benefited from advise on content and presentation which I received from Mr. Ofwono and Mr. Otiya Muhammad.

I welcome any suggestions for improvement to continue making my service delivery better.

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RONALD SSEKYANZI

INTRODUCTION TO CHEMISTRY PAPER 1 (545/1)

The revised new lower secondary curriculum requires a learner to do **two** papers ie theory and practical compared to the old curriculum which had three papers.

In this book we shall concentrate on the theory paper 545/1.

The entire content of theory was grouped into four elements of construct to avoid duplicating/ multiple testing of competences.

The paper has **two** sections; section **A** that has **two** compulsory items and section **B** has **two** parts ie part **I** having **two** items and **part II** also having **two** items and the learner is requested to attempt only **one** item from each of the two parts. The learner will be required to attempt a total **four** examination items **two** from section A and **two** from section B from the four elements of construct which we are going to explore in details.

THE LISTS OF ALL TOPICS IN THE THEORY PAPER ARE AS FOLLOWS

SENIOR 1	THEME	TOPIC
Term 1	Introduction to chemistry and experimental	Chemistry and society
		Experimental chemistry
	Particle nature of matter	States and changes of states of matter
		Using materials
Term 2	Temporary and permanent changes to materials	Temporary and permanent changes
		Mixtures, elements and compounds
Term 3	Air and environment	Air
		Water
	Earth and space	Rocks and minerals

SENIOR 2	THEME	TOPIC
Term 1	Acids and alkalis	Acids and alkalis
		Salts
	The periodic table	The periodic table
Term 2	Carbon in the environment	Carbon in the environment
Term 3	Order of reactivity of metals	The reactivity series

SENIOR 3	THEME	TOPIC
Term 1	Carbon in life	Carbon in life
	Structures and Bonds	Structures and Bonds
Term 2	Using equations in Chemistry	Formulae, stoichiometry and mole concept
	Structures and substances	Properties and structures of substances
Term 3	Fuels and energy	Fossil Fuels
	Reactants and products	Chemical reactions

SENIOR 4	THEME	TOPIC
Term 1	Redox reactions	Oxidation and reduction reactions
		Industrial processes
Term 2	Periodicity	Trends in the periodic table
	Thermochemistry	Energy changes during chemical reactions
Term 3	Consumable chemicals	Chemical for consumers Nuclear processes.

A breakdown of the first four elements of construct

FIRST ELEMENT OF CONSTRUCT

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

Topics

- Air (oxygen)
- Industrial processes
- Chemistry and society
- Carbon in life (mainly on crude oil, fermentation and saponification)
- Chemical reactions (contact and haber processes)
- Oxidation and reduction. (in iron extraction and for the concepts of electrolysis in extraction of aluminum, copper, manufacture of sodium hydroxide and chlorine)

ASSESSABLE AREAS

(a) Manufacture of oxygen gas (b) Manufacture of chlorine gas (c) Extraction of metals(Na, Al, Fe, Cu, Zn) (d) Manufacture of fertilizers (e) Manufacture of detergents	(f) Manufacture of sodium hydroxide (g) Manufacture of sulphuric acid (h) Manufacture of cement (i) Manufacture of Ethanol (j) Manufacture of bio gas	Each Process involves V – vessel Cp – chemical processes Cd – conversion to desired product Ch – coherence Pr –purification
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BASIS OF ASSESSMENT

BASIS OF ASSESSMENT		CRITERIA OF ASSESSMENT
A	Raw materials Rm	All raw material
		any one raw material
		no raw material
B	Process of production Pp	Process of production with all V, Cp, Ch, Pr
		Process of production with any three of V, Cp, Ch, Pr
		Process of production with any one of V, Cp, Ch, Pr
		No process of production
C	Side effects of the process of production and mitigation Se	Any one danger identified, explained and mitigated
		Any one danger identified and explained OR identified and mitigated OR explained and mitigated
		Any one danger identified OR explained OR mitigated
		No danger identified, explained or mitigated
D	Social benefits of the process of production Sb	Any one social benefit identified, effect of the benefit and impact of the benefit
		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
		Any one social benefit identified OR effect of the benefit OR impact of the benefit
		No social benefit identified

LET'S EXPLORE THE SUMMARY NOTES ON THE ASSESSABLE AREAS FOR THIS ELEMENT OF CONSTRUCT

MANUFACTURE OF OXYGEN

Air is a mixture of different components contains 21% oxygen. Due to respiratory illnesses caused by COVID-19, there was an increased demand for oxygen by patients in hospitals. The government supply of oxygen is not enough and is planning to set up an oxygen production plant with minimal environmental impact.



However, the science club members in your school would like to know how the process of production of oxygen will be carried out.

Task:

As a chemistry student, make a summary you will use during the presentation.

Expected responses following the basis of assessment

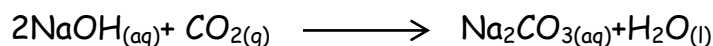
Raw materials

Liquid air/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 absorb/ remove carbon dioxide which is acidic.



Air free from Carbon dioxide is now passed through Silicon (IV) oxide/silica to absorb water vapor. Carbon dioxide and water vapor are removed from air before it is liquefied because they solidify and block the apparatus.

The air is now compressed at 200 atmospheres and allowed to cool by making it escape into a large space through a jet. The process of cooling is repeated several times to obtain liquid air at about -200°C . The liquid air is fractionally distilled using a fractionating column/tower. Nitrogen boils off first because it has a lower boiling point (-196°C) leaving behind Oxygen with a higher boiling point (-183°C). Both nitrogen and Oxygen collected contain traces of noble gases. Pure oxygen is then stored under pressure in steel cylinders.

Side effects of the production and mitigation

- (a) Explosion of oxygen cylinders due to high pressure. This can cause other materials to ignite spontaneously/ catch fire. The resulting fire can cause damage to equipment and injury to people.

Mitigation

- ✓ Regular maintenance and monitoring of cylinders
- ✓ Keeping cylinders in a cool area/ avoid exposure to heat.

- (b) Exposure to liquid oxygen can cause severe skins and eye irritation and burns. This may cause loss of vision and cancer.

Mitigation

- ✓ Posting hazard and warning information in the working area.
- ✓ Communicating all information on the health and safety hazards of oxygen to potentially exposed workers; for example submerging the affected body in warm water.

(c) Air pollution by waste gases. Acidic gases can cause acidic rain which leads to crumbling of buildings, lowering the soil PH and corrosion of roofs made of iron.

Mitigation

- ✓ Fitting catalytic converters in exhaust pipes of machines to convert oxides of nitrogen into nitrogen and Carbon monoxide to Carbon dioxide.
- ✓ Neutralize the acidic gases before releasing waste gases into the atmosphere.

Social benefits of the process of production

- ✓ Employment opportunity; improved income thus better standard of living.
- ✓ Development of infrastructure eg electricity lines, roads, hospitals and schools. Etc., improved road network will facilitate trade hence improved income and better standards of living.

MANUFACTURE OF CHLORINE (INDUSTRIAL)

Sample scenario

One of the large scale uses of chlorine is treating water, to ensure that chlorine is readily available and at a cheaper cost, Government has cleared a local investor to set up a chlorine production plant near Lake Katwe in Kasese district. However, the community is concerned about its environmental effects and how the environmental process will occur

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