ADVANCED LEVEL CHEMISTRY

Assessment Guidelines • Advanced Secondary Curriculum (ASC)

Session Outcomes

1. Appreciate the nature of Test Items used to assess learner achievement under the Adapted Competency-based Curriculum.
2. Develop appropriate assessment items for A-Level Chemistry and score them.

What Presentation covers

1. Introduction
2. Constructs, AOs and Related Topics
3. Structure of Assessment papers
4. Sample Assessment Items
5. Scoring Learner's responses

Why Assess Chemistry?

- To determine how well a learner understands chemical principles and can apply them to explain, analyse, and solve novel problems using accurate practical, mathematical, and scientific reasoning, supported by sound experimental knowledge and clear communication

1) Introduction

- At the end of the L.S. Education cycle, Chemistry shall be assessed by UNEB.
- The teacher needs to know how the teaching and learning process is going to be assessed.
- Learners should be adequately prepared to demonstrate their levels of competency in the subject.

2) Constructs, AOs and Related Topics

Foundations of atomic structure, bonding and periodicity of elements	**AO1:** Demonstrate understanding of atomic and molecular structures, periodic trends and patterns of chemical reactivity across the Periodic Table.	2. Atomic and electronic structure 3. Bonding and structure 4. Periodicity I 11. Periodicity II
Structure, reactivity and applications of organic molecules	**AO2:** Analyse the structure, reactivity, and transformation pathways of organic compounds to predict chemical behaviour, explain natural processes, and propose solutions in real-world and innovative chemical contexts.	6. Organic chemistry 1 9. Organic chemistry II 12. Organic chemistry III
Stoichiometry, Thermochemistry and Reaction Kinetics	**AO3:** Apply quantitative chemical principles to analyse, model and predict the amounts of substances, energy changes and reaction rates in chemical systems under varying conditions.	1. Moles and equations 5. Thermochemistry 13. Reaction Kinetics
Chemical Equilibria and Electrochemical Systems	**AO4:** Apply principles of chemical and physical equilibria and electrochemistry to interpret, predict and evaluate the behaviour of chemical systems in industrial and real-world contexts.	7. Equilibria I 8. Equilibria II 10. Electrochemistry

3) Structure of the assessment papers

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Paper 1 (Theory) + Paper 2 (Practical)

Paper 1 — Theory (2h 45m)

Section A (AO3)
1 compulsory item

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Section A (AO4)
1 compulsory item

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Section B
Part I **(AO1):** attempt 1 of 2 items

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Section B
Part II **(AO2):** attempt 1 of 2 items

Paper 2 — Practical (3h 15m)

2 compulsory items
picked from any of the 4 constructs

- Tests science process skills:
- Aim, variables, hypothesis
- Method & safety
- Data presentation & analysis
- Conclusion + recommendations

Practical items can focus on environmental monitoring (e.g., river turbidity), water treatment, or industrial chemistry.

4) Sample Assessment Item (Theory)

Your chemistry class has been invited by a chemical plant management near Lake Victoria to assist in identifying ways of optimising the production of key industrial compounds including sodium oxide, magnesium oxide and silicon dioxide used in glassmaking and ceramics. The plant management has observed inconsistencies in melting points and reactivity, which are affecting product quality and safety. You are tasked with conducting a scientific investigation to analyse periodic trends of the elements, compound properties, and molecular structures to recommend improvements. Important chemical data of the findings about the elements and their compounds is provided in the table below to assist in the analysis.

Element	Atomic Number	Atomic Radius (pm)	Ionisation Energy (kJ/mol)	Melting Point (°C)	Oxide Melting Point (°C)
Sodium (Na)	11	186	496	98	1275
Magnesium (Mg)	12	160	738	650	2800
Aluminium (Al)	13	143	578	660	2072
Silicon (Si)	14	118	786	1410	1710
Phosphorus (P)	15	110	1012	44	580
Sulphur (S)	16	104	1000	115	Gas/Sublimes
Chlorine (Cl)	17	99	1251	-101	Gas/Gas

Task

As a chemistry learner, write a report about the periodic trends of the elements and their oxides, and recommend improvements to the plant's production processes.

4) Sample Assessment Item (Practical)

ITEM

In an industrial town, a number of small-scale factories near a river have been reported to discharge wastewater containing various chemicals, including hydrochloric acid, into nearby drainage channels. Recently, the environmental supervisory body observed milky cloudiness and poor visibility in parts of the river, believed to exist due to chemical reactions.

The supervisory body suspects that the cloudiness could be a result of a reaction between sodium thiosulphate ($Na_2S_2O_3$), commonly used in some textile industries and hydrochloric acid (HCl). The reaction produces elemental sulphur, which appears as a white precipitate and causes turbidity. To understand how this reaction contributes to pollution, it is important to study how varying concentrations of sodium thiosulphate affect the rate of reaction, and thus, the extent of pollution. You have been contacted to give recommendations based on your investigations.

You are provided with the following reagents:

- FA1 which is0.1M Sodium thiosulphate solution
- FA2 which is 2M hydrochloric acid
- Distilled water
- A variety of laboratory apparatus and materials

Task

Design an experiment to determine the order of reaction with respect to the concentration of sodium thiosulphate in the reaction and write a report of your findings.

5) Scoring Learner's Response (Theory)

Output	Basis of evaluation	Score 4	Score 3	Score 2	Score 1
A structured technical report that explains key periodic trends and oxide properties, applies them to the plant's production context, and presents 3–5 evidence-based process improvement recommendations (with brief scientific justification for each).	**Interpretation of the scenario/Task:** *Understanding of Periodic Trends*	Accurately explains the trend in atomic radius and ionisation energy and connects it to reactivity.	Accurately explains both trends clearly with relevant connections to reactivity for one of the properties.	Explains both trends, but does not clearly link them to reactivity.	Misinterprets trends or states the trends with vague or inadequate explanations lacking understanding of reactivity implications.
	Analysing the situation: *Analysis of Compound Properties*	Thorough comparison of melting points and bonding types with accurate chemical reasoning.	Good comparison with mostly accurate explanations of bonding and melting points.	Basic comparison; some inaccuracies in bonding or melting point analysis.	Limited or inaccurate comparison; explanations are vague or partially incorrect.
	Logical flow of ideas: *Explanation of Molecular Structure*	Detailed and accurate description of silicon dioxide's structure, bonding, and industrial relevance.	Clear explanation of structure and bonding with relevant industrial links.	Basic description; some relevant points about structure and use.	Limited understanding of molecular structure or missing explanation of structure and industrial relevance/application.
	Recommendations for Optimisation	Innovative, feasible, and well-justified recommendations based on chemical evidence.	Practical and justified recommendations with some chemical reasoning.	Basic recommendations; justification is present, but limited.	Few recommendations; weak or unclear or no justification provided .
	Scientific Communication	Report is exceptionally well-organised, uses precise terminology, and includes diagrams or data effectively.	Report is well-structured, uses appropriate terminology, and includes some visuals.	Report is organised; terminology is mostly correct; visuals may be limited.	Report lacks clear structure; terminology is inconsistent or incorrect; visuals are minimal or no visuals used.