Province of the
EASTERN CAPE
EDUCATION

EXAMINATIONS AND ASSESSMENT CHIEF DIRECTORATE
Home of Examinations and Assessment, Zone 6, Zwelitsha, 5600
REPUBLIC OF SOUTH AFRICA, Website: www.ecdoe.gov.za

2023 NSC CHIEF MARKER'S REPORT

SUBJECT	**Technical Sciences**
QUESTION PAPER	2
DURATION OF QUESTION PAPER	**1 ½ hours**
PROVINCE	EASTERN CAPE
DATES OF MARKING	**5- 19 Dec 2023**

SECTION 1: (General overview of Learner Performance in the question paper as a whole)

The learner performance is based on the relative performance of sampled 100 scripts tabled and graphed below (see table 2, figure 4 and figure 5). An overall performance of 45,5**%** was attained from the sample, which showed a 0,5 % improvement compared to 2022 presentation which was 45%. Founded on the presented data from sampled 100 scripts, questions 3, 4 & 5 (**physical properties of organic molecules** -31**% & organic reactions 37% and electrolytic cell- 36%)** remains the most poorly performed question, once more followed by question 1**(43%).**

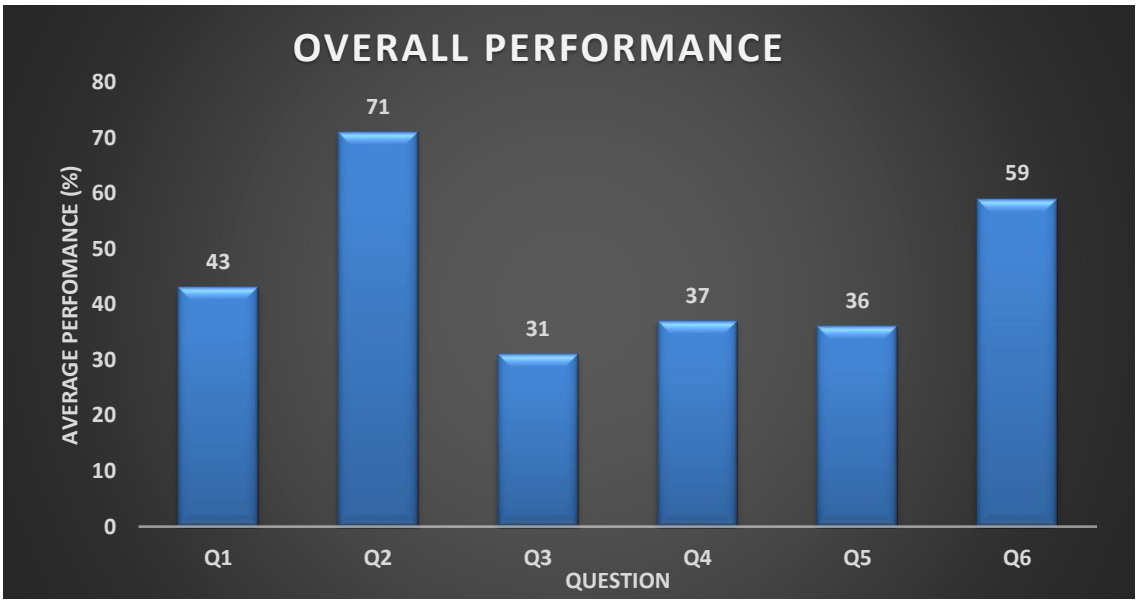

Figure 4

The better performed questions were question 2 (Basic organic Compounds) and question 6(galvanic cell) respectively; with an average performance that ranges between 59% and 71 % which is not an outstanding performance at all.

The summary of sub-question results is tabled in table 2 and represented graphically in figure 4.

Table 2: Question by Question average performance

Sub-question	Topic	Ave. Performance %
1.1	Basic organic compounds	89
1.2	Physical properties	16
1.3	Electronic properties of matter	44
1.4	Galvanic cell	32
1.5	Electrolytic cell	33
2.1	Basic organic compounds	31
2.2.1	Basic organic compounds	85
2.2.2	Basic organic compounds	70
2.2.3	Basic organic compounds	92
2.3.1	Basic organic compounds	93
2.3.2	Basic organic compounds	81
2.4	Basic organic compounds	52
2.5	Basic organic compounds	75
2.6	Basic organic compounds	78
3.1	Physical properties of organic compounds	34
3.2	Physical properties of organic compounds	48
3.3.1	Physical properties of organic compounds	36
3.3.2	Physical properties of organic compounds	3
3.3.3	Physical properties of organic compounds	10
3.3.4	Physical properties of organic compounds	63
3.3.5	Physical properties of organic compounds	19
4.1.1	Organic reactions	82
4.1.2	Organic reactions	69
4.2	Organic reactions	28
4.3	Organic reactions	51
4.4	Organic reactions	18

4.5.1	Organic reactions	24
4.5.2	Organic reactions	22
5.1	Electrolytic cell	21
5.2	Electrolytic cell	66
5.3	Electrolytic cell	45
5.4.1	Electrolytic cell	26
5.4.2	Electrolytic cell	14
5.5	Electrolytic cell	37
5.6	Electrolytic cell	39
6.1	Galvanic cell	77
6.2	Galvanic cell	37
6.3	Galvanic cell	74
6.4	Galvanic cell	7
6.5	Galvanic cell	46
6.6	Galvanic cell	50

Figure 3 below shows the performance summary on each sub-question

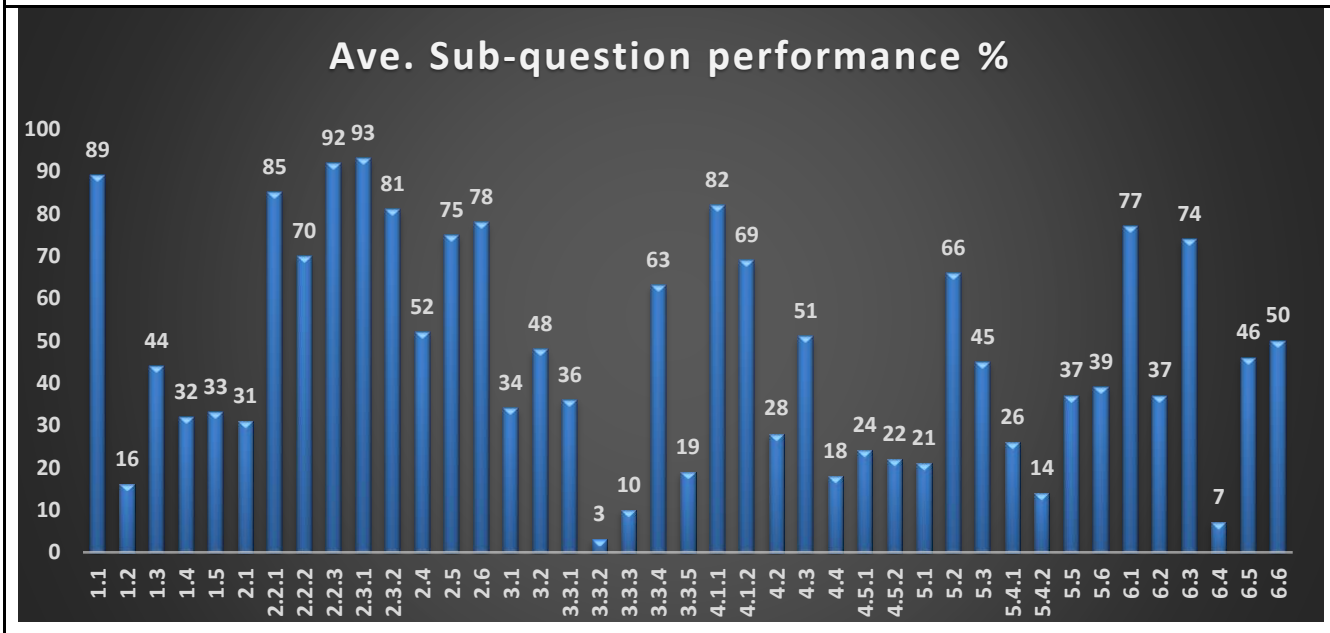

Figure 5

SECTION 2: Comment on candidates' performance in individual questions

QUESTION 1

(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?

QUESTION 1

The average performance for question 1 is 48 %, this is a significantly a critical underperformance. The graph below depicts the performance in question 1.

Table 3: question 1MCQ average performance

Sub-question	Topic	Ave. performance %
1.1	Basic organic compounds	89
1.2	Physical properties	16
1.3	Electronic properties of matter	44
1.4	Galvanic cell	32
1.5	Electrolytic cell	33

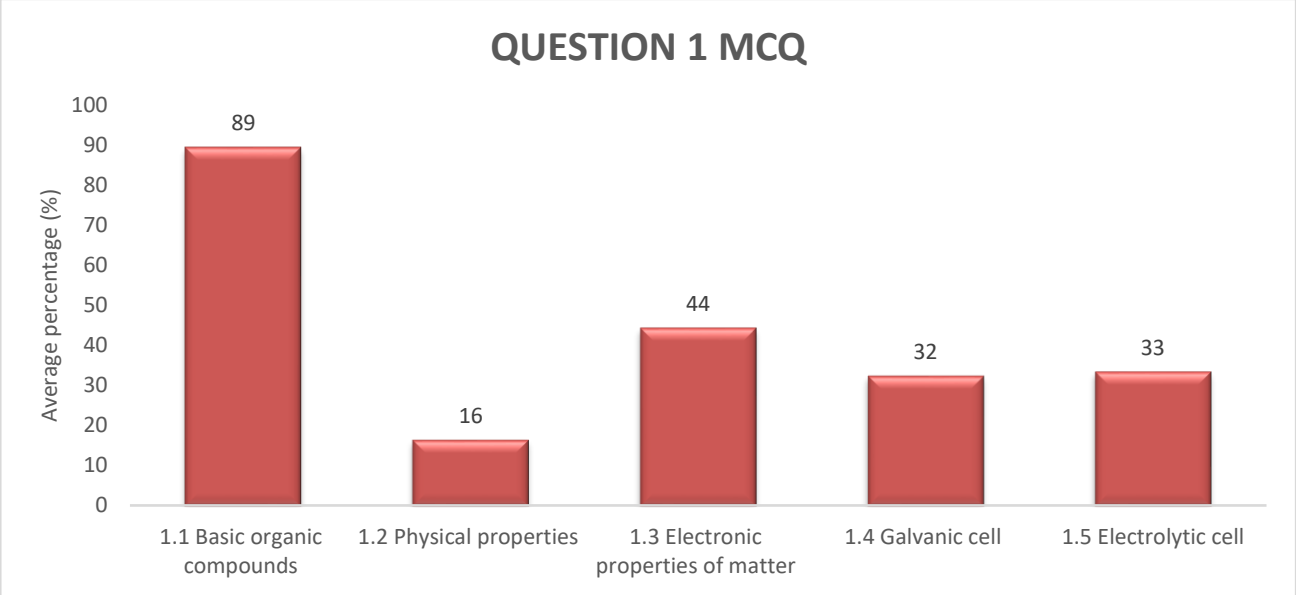

Figure 4

Question 1 was poorly answered especially 1.2, 1.4 &1.5 (intermolecular forces, electronic properties of matter &electrolytic cell) . As portrayed by the graph are the questions that made the whole question to attain an average of 43 %. The question 1 percentage in comparison with the 2020 one, has declined by 5 % where the average percentage was 48%.

(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.

Question 1.2 specifically was poorly performed owing to lack of understanding of physical properties,

candidates could not differentiate between intermolecular forces and interatomic forces.

1.4 was poorly answered because learners could not identify the reducing agent from the cell notation.

In 1.5 candidates underperformed because they could not state the flow of anions.

(c) Provide suggestions for improvement in relation to Teaching and Learning

Learners should be trained in explaining the difference between intermolecular and interatomic forces and thorough revision be done on physical properties of organic compounds.

Grade 11 and 12 Electrochemistry should be taught and revised at length and learners be exposed to different types of answering questions.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.

Questions 1.2, 1.4 &1.5 also indicated that learners do not have deep understanding of the physical properties of organic compounds, electrolytic cell and galvanic cell.

QUESTION 2

Table 4: Question 2 :BASIC ORGANIC COMPOUNDS average performance

Sub-question	Topic	Ave. performance %
2.1	Definition of Organic molecule	31
2.2.1	Polymer of ethene	85
2.2.2	Positional isomer	70
2.2.3	Alkane	92
2.3.1	Structural formula of compound A	93
2.3.2	Structural formula of compound D	81
2.4	Definition of functional isomer	52
2.5	IUPAC name of Compound F	75
2.6	Name of homologous series of Compound E	78

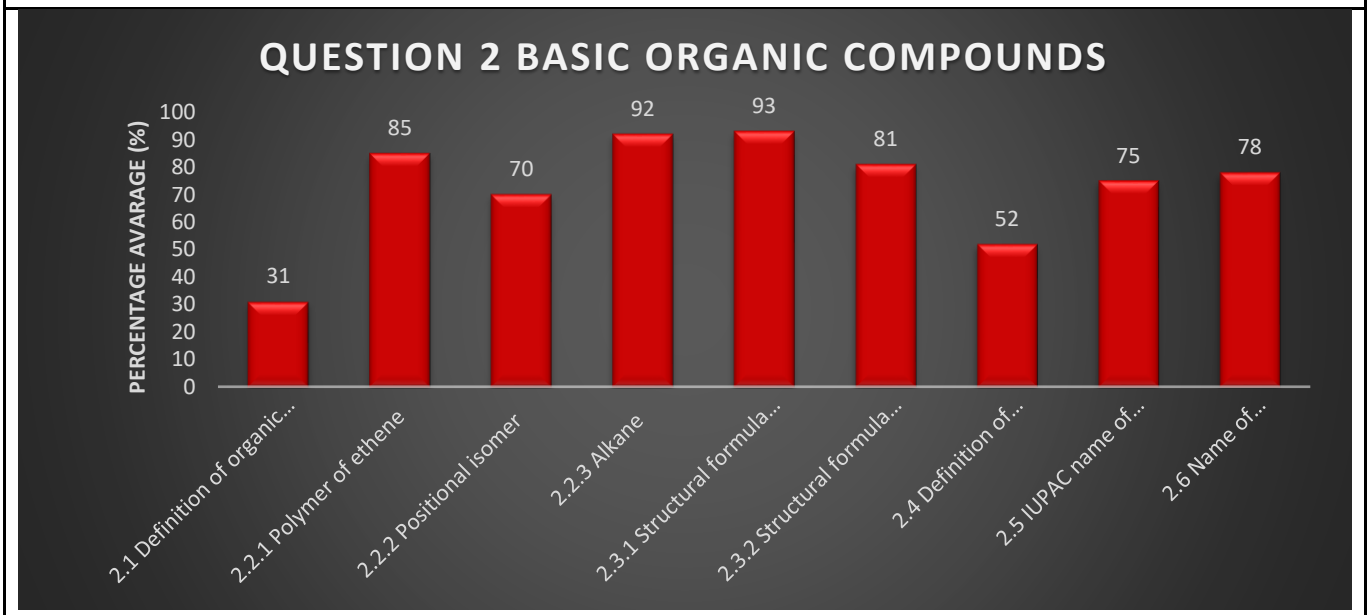

Figure 5

QUESTION 2 was performed at an average of 71 % compared to 59 % in 2022 which implies that there is an improvement of 12%. However, 2.1 (definition of organic molecule) and 2.4 (definition of a functional isomer) were poorly answered.

(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.

In, 2.1 (definition of organic molecule) and 2.4 (definition of a functional isomer), it is evident that the learners did not study the definitions from proper documents. Learners were adding the word **'only'** in the definition of organic molecule and in 2.4 most learners confused definition of a functional isomers with those of other types of isomers

(c) Provide suggestions for improvement in relation to Teaching and Learning

The topic needs thorough revision and practice, more time should be given to definition of concepts, isomers, and different homologous series. A clear distinction between the prefixes and suffixes must be made when learners are taught different homologous series. Nomenclature should be executed thoroughly. Key words need to be emphasized in definitions and learners be provided with examination guidelines.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.

Use of relevant documents like policy documents and exam guidelines need to be prioritised.

Practical assessment task should be done in all topics, not only the prescribed PATs should be given a priority. Ample time for revision must be catered for. 2023/ 24 recovery curriculum and assessment plans and revised Annual Teaching Plans (ATPs) should be thoroughly explained to teachers and Subject advisors should make sure that these documents are implemented at schools.

QUESTION 3

Table 5: Question 3 PHYSICAL PROPERTIES OF ORGANIC MATTER : Average performance

Sub-question	Topic	Ave. performance %
3.1	Definition of Melting point	34
3.2	Difference in melting points of A & B	48
3.3.1	Explaining Fair Comparison	36
3.3.2	Investigative Question	3
3.3.3	Independent Variable	10
3.3.4	Viscosity of A & C	63
3.3.5	Justification of answer in 3.3.4	19

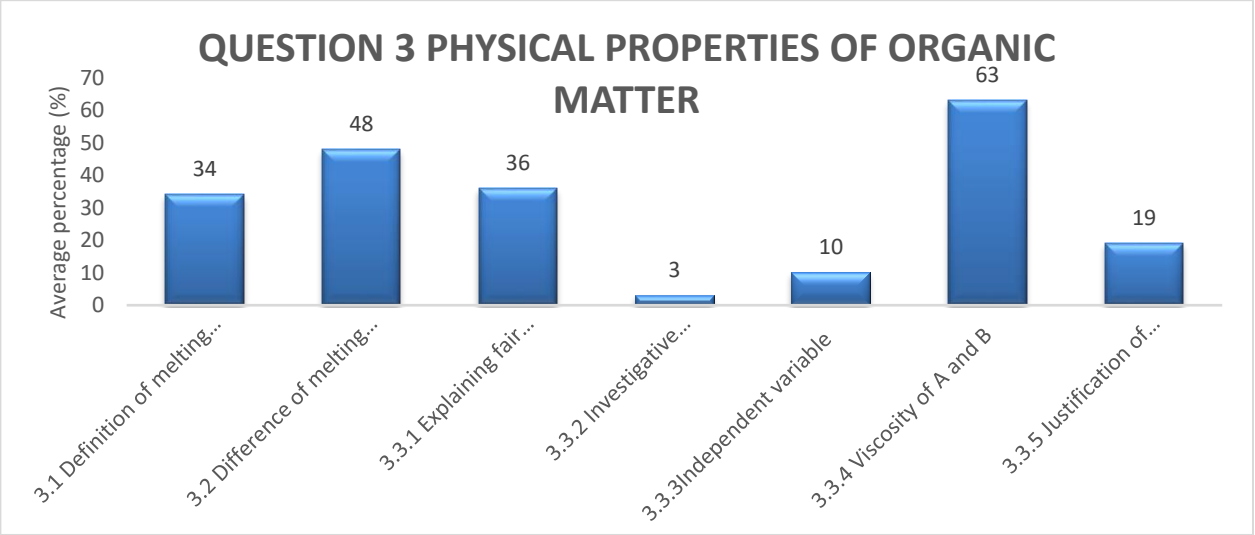

Figure 6

Question 3 was performed at 31 % on average and has declined by 26 % compared to 2022 where it was 57 %.

Questions 3.1, 3.3.1, 3.3.2, 3.3.3, 3.3.5 were poorly answered at a range of 3% and 36%.

(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.

The underperformed questions needed the learners to interpret the table to give explanation for the differences and trends in melting points.

In Questions 3.1, 3.3.1, 3.3.2, 3.3.3, 3.3.5, learners failed to explain the trends in boiling points of an alkane and an alcohol that were provided in the table. The main reason that learners could not score marks in this question is due to learners' inability to mention both compounds, types, and strength of Intermolecular Forces as well in the explanations and justifications. Learners had poor understanding of different strength of intermolecular forces from different homologous series. Additionally, learners used IMF instead of intermolecular forces which is not according to policy.

Furthermore, learners were unable to relate Intermolecular forces with physical properties of organic molecules.

(c) Provide suggestions for improvement in relation to Teaching and Learning

When explaining the trends in physical properties the following aspects should be taken into consideration:

Mention the: organic molecules/ compounds in question (A and B, A and C)

The chain length ((branched/spherical/longer chain)/surface area)

The type of intermolecular forces

Strength of intermolecular forces.

Strength of intermolecular forces (weaker/ stronger)

Energy required to OVERCOME intermolecular forces (more/less)

Learners should also be trained on arranging compounds according to decrease/increase in vapour pressure, boiling points, melting points and viscosity.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.

Questions that need **explanations** should be included in **informal tasks.**
Learners should be trained on writing the phrase "**TO OVERCOME INTERMOLECULAR FORCES**" not to break the bonds when explaining the trends of physical properties.
When comparing two compounds, learners should be taught to **mention all the** compounds and not be too general but be **specific to the given compounds and intermolecular forces**.
A resource manual for different types of questions should be developed to assist learners with expected assessment tasks. The manual will not replace the existing LTSM but will expose learners to various assessment tasks.

QUESTION 4

Table 6: Question 4 ORGANIC REACTIONS average performance

Sub-question	Topic	Ave. performance %
4.1.1	Type of reaction (1)	82
4.1.2	Type of reaction (2)	69
4.2	Chemical equation for reaction 1	28
4.3	Name or formula for compound X	51
4.4	Alcohol formed in excess water	18
4.5.1	Definition of Macromolecule	24
4.5.2	Definition of Polymerisation	22

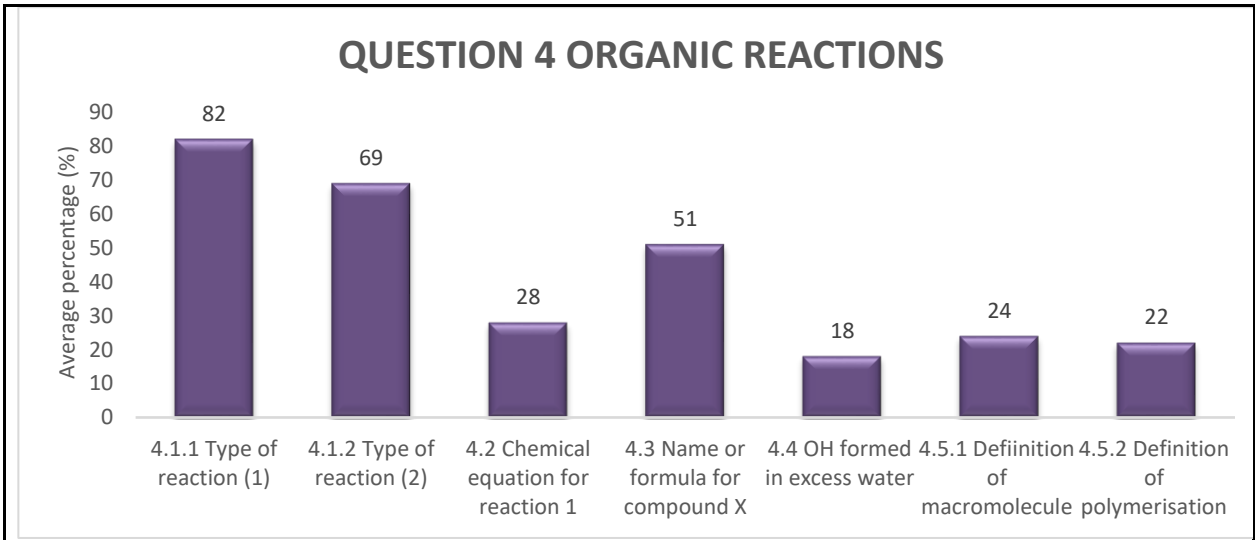

Figure 7

This question was answered at an achievement of 41 % in 2022 and declined to 37 % in 2023 with 4% decline rate. Questions 4.2 (chemical equation for reaction 1), 4.4 (alcohol formed in excess water), 4.5.1 (definition of a macromolecule) and 4.5.2. (definition of a polymer) were noticeably underperformed which pulled the performance in question 4 down. Organic reactions generally are still a challenge to learners, they couldn't interpret the given equations and follow through the flow diagram.

(b) Why the question was poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.

Questions 4.2 (chemical equation for reaction 1), 4.4 (alcohol formed in excess water), 4.5.1 (definition of a macromolecule) and 4.5.2. (definition of a polymer) In learners struggled to write the chemical equation for for reaction 1, failed to provide reaction conditions for formation of alcohol in excess water, and could not define a macromolecule and polymer.

(c). Provide suggestions for improvement in relation to Teaching and Learning
Interpretation of flow diagrams and understanding of reaction conditions should be the integral part in the teaching of organic reactions and should be assessed in all assessment tasks, both formal and informal.

Teachers should use a variety of flow diagram type questions to train the learners how to answer these questions. Expose learners to various organic reactions, writing them using structural formulae, condensed structural formulae and molecular formulae.
Emphasis should be placed on studying the reaction conditions for the different reactions. Learners must also be taught to write all words needed in the reaction condition such as concentrated/dilute acid instead of just saying acid and mild heat instead of writing just heat.
Learners should be taught key words that will help define concepts.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.

Teachers should teach learners how to balance chemical equations. Emphasis should be placed on the difference between molecular and structural formulae by giving the learners activities where they need to write balanced chemical equations by using both molecular formulae and structural formulae. More exercises should be on electronic properties of matter and learners be informed that this section has been moved from paper 1 to paper 2.

QUESTION 5

(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?

Question 5 has declined in comparison with 2020 where it was performed at 50%, the section declined to 50% which is 18,7% diminish. The sub-questions that dropped the performance in question 5 were: 5.1.1 (Name of a cation - 0%), 5.1.2 (Name of an anion-3%), 5.2.1 and 5.2.2 (which electrode is an anode and which is a cathode- 20%).

Table 7: Question 5 Electrolytic Cell average performance

Sub-question	Topic	Ave. performance %
5.1	Definition of electrolyte	21
5.2	Energy conversions	66
5.3	Predicting Spontaneous/ nonspontaneous reaction	45
5.4.1	Type of reaction occurring at iron bar	26
5.4.2	Half reaction occurring at electrode X	14
5.5	Reasons why iron bar is electroplated with silver	37
5.6	Advantages of using biodiesel	39

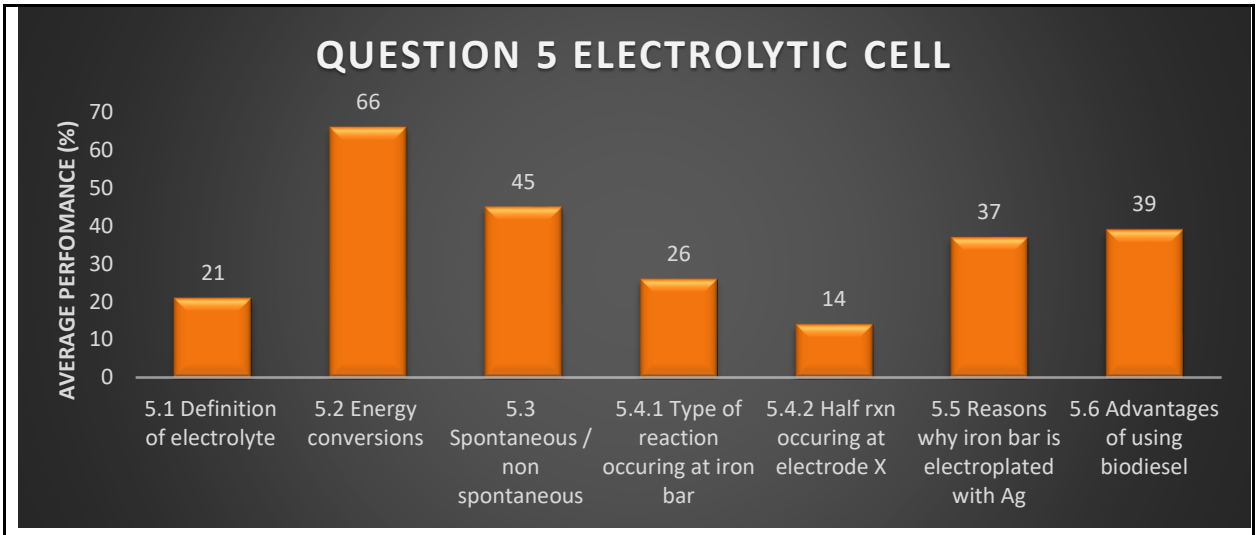

Figure 8

Question 5 was performed between 14% and 66% which means the question is mostly underperformed at anaverage of 36% which is serial underperformance. There is a slight improvement of 2% in this question though it has been underperformed.

(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.

In Q 5.1, 5.4.1, 5. 4.2, 5.5 and 5.6 Candidates struggled to:

Q5.1: define an electrolyte.

Q5.4.1 type of reaction occurring on the iron bar,

Q5.4. write the reasons for electroplating iron bar.

Q5.6 write advantages of using biodiesel.

(c) Provide suggestions for improvement in relation to Teaching and Learning

The National setting panel should kindly provide an official document which will serve as a source for candidates, teachers, and subject advisors to extract advantages of using biodiesel to help have a relevant scope to answer questions in this section.

Teachers should stress the importance of studying definitions especially from exam guidelines and CAPS and assess them frequently. In this chapter there are certain definitions that are always examined, and teachers should point them out to the learners.

Teachers should clearly explain the difference between the electrolytic cell and the galvanic cell and the processes occurring in these cells.

Teachers should do the electrolysis of copper (II)chloride experiment with the learners for them to observe the Cl_2 gas bubbles formed at the anode and the red brown deposit formed on the cathode. **Names and symbols** of ions should be clearly taught and practised by learners.

The table of standard reduction potentials should be clearly explained to the learners and teachers should train the learners on how to use the table. Informal and formal assessments should be done to train the learners on how to answer this question.

Learners should be taught to **draw** and **label** the components of an electrolytic cell.

(d) Describe any other specific observations relating to responses of learners and comments

that are useful to teachers, subject advisors, teacher development etc.

The table of reduction potentials should be thoroughly practised on writing of half and net reactions.

Emphasis on the following cell should be made:

Use of the voltmeter, cell /battery/power source / globe in an electrolytic

Power source provides energy in an electrolytic cell

Clear differences between an electrolytic cell and galvanic cell should be tabulated.

Proper use of policy documents should be maintained.

Question 6

The overall performance of the question is 59, % which is 25 % improvement compared to 2022 where the percentage was 34%. This question was one of the most well performed questions in the entire question paper but is not a good performance when measured on the performance scales**.**

6.1 (Definition of Oxidation) was performed at 77% and was the best performance in the entire question however, it is not a very good performance for this section.

6.2 (identifying negative electrode) was underperformed at 37%.

6.3 (flow of electrons) was performed at 74% which is a very pleasing performance.

6.4 (Observation at silver electrode) was performed at a glaring percentage of 7%.

6.5 (Cell notation) was performed at an average of 46%.

6.6 (Use of calculations to determine whether bulb will glow)was performed at 50%.

The underperformance in these questions severely affected the overall performance of learners in Tech Sciences P2.

Table 8: Question 6 Galvanic Cell average performance

Sub-question	Topic	Ave. performance %
6.1	Definition of oxidation	77
6.2	Identifying negative electrode	37
6.3	Flow of electrons	74
6.4	Observation at silver electrode	7
6.5	Cell notation	46
6.6	Use of calculations to determine whether bulb will glow	50

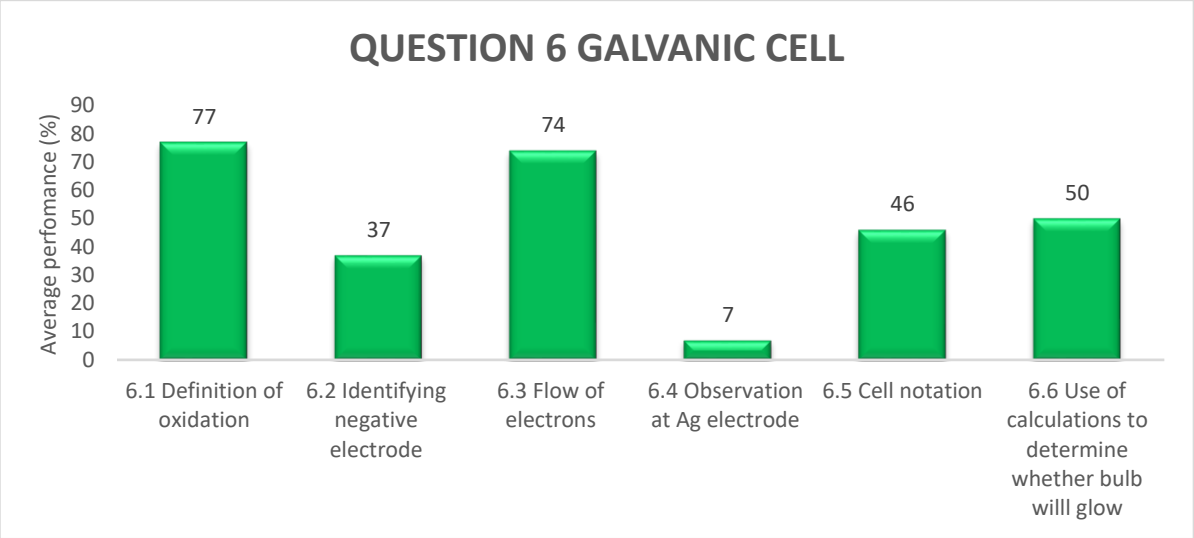

Figure 9

(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.

In 6.2 (identifying negative electrode) was underperformed at 37% because candidates were unable to reason properly using the given information as to which electrode will be anode or cathode.

Question 6.4 (Observation at silver electrode) was performed at a glaring percentage of 7% because learners used information From PAT 3 where silver become shinier. Most candidates wrote "shinier" and not options give in the marking guide.

6.5 (Cell notation) was performed at an average of 46% and most candidates wrote the net reaction instead of cell notation. Some learners omitted the charges in ions.

6.6 (Use of calculations to determine whether bulb will glow) was performed at 50%. Most learners wrote wrong formula, some substituted incorrectly, some did not write the SI units in the final answer. and a few calculated correctly but did not conclude after calculating.

(c) Provide suggestions for improvement in relation to Teaching and Learning

- Teachers should emphas
-
- ize the differences between the electrolytic and galvanic cell and show the learners what the two cells look like as well as pointing out by means of the diagrams what the differences are.
- More time should be spent on explaining to the learners how to use the table of standard reduction potentials, identifying the anode, oxidation half reactions, cathode, reduction half reactions and writing of net reactions with their cell notations. Learners must be taught correct use of formulae for emf and how to substitute in an equation.
- Learners should also be exposed to marking criteria so that they picture how marks are allocated in calculations.
- Informal and formal assessments should be done to train learners on how to answer questions on various sets of Galvanic cells.
- Teachers should take time to develop learners' problem- solving skills which will help learners in solving calculations in this section.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.

Learners in this section should be exposed to the following in this chapter:

- ✓ Drawing of galvanic cell
- ✓ Labelling galvanic cell
- ✓ Proper use of table of reduction potentials
- ✓ Identification of anode and cathode
- ✓ Names and formulae of ions, electrolytes
- ✓ Correct writing of formulae for emf as they are in the formula book
- ✓ Energy conversions in a galvanic cell
- ✓ Standard conditions for setting up an electrochemical cell

The succeeding aspects mentioned will assist learners to understand the scientific phenomena:

- ➢ Scientific language in teaching and learning
- ➢ Scientific diagrams in examples and assessment,
- ➢ Practical work other than prescribed PAT, videos,
- ➢ and simulations on galvanic cells
- ➢ Copies of examination guidelines available to learners,
- ➢ Policy documents
- ➢ Question banks generated from previous question papers for assessment readiness.