MAURITIUS EXAMINATIONS SYNDICATE

NCE 2020-2021
GRADE 9
CHEMISTRY

Subject code: N530

EXAMINERS' REPORT

April 2022

INTRODUCTION

The Nine Year Basic Continuous Education (NYBCE) includes two national assessments namely Primary School Achievement Certificate (PSAC), which is the first assessment at the end of the primary cycle and the National Certificate of Education (NCE), the second assessment which is taken at the end of Grade 9. The first cohort of Grade 9 candidates sat for the NCE assessment in March/April 2021.

The NCE assessment in Science is in line with the philosophy adopted in the National Curriculum Framework (NCF) and detailed in the Teaching and Learning Syllabus (TLS). The Science paper is assessed in three separate papers namely Biology, Chemistry and Physics. Each paper is based on the three assessment objectives as depicted in **Table 1**.

Table 1: Assessment Objectives

	Assessment Objective	**Weighting**
AO1	Knowledge with understanding	45 – 50
AO2	Application	25 - 35
AO3	Scientific Inquiry	20 - 25

Due to the COVID 19 situation, NCE assessment for Chemistry for the year 2021 was based on a 'deloaded' specification. Whilst the four units including 'The Atmosphere and Environment around us', 'Mixtures and Separation Techniques', 'Language of Chemistry' and 'Metals and Reactivity Series' were fully assessed, a significant part of the unit 'Salt' was not assessed.

The examiners' report for Chemistry component of the Science assessment offers a constructive feedback on candidates' performance and guidance for future candidates. The contents of the syllabus that gave rise to misconceptions are included in the report. It also highlights gaps in the conceptual understanding of candidates. Other aspects which caused difficulty, along with possible reasons, are also commented on. Key messages are included to draw the attention of Educators on the essential areas to focus on.

This report should be read in conjunction with the question paper for the examination.

KEY MESSAGES

- Better performing candidates had good examination techniques, such as underlining of command words in the questions. Candidates should be encouraged to read questions carefully in order to understand what exactly is being asked. This was particularly the case in **Question 4(a)(ii)**. Practice of reading and interpreting data-based questions should also be emphasised.

- Observations are those which you can see. For example, 'fizzing, bubbles or effervescence' is an observation; 'Hydrogen was given off' is not an observation.

- Candidates should avoid giving lists of answers, as an incorrect response can contradict a correct one. For example, if the correct answer is 'precipitate dissolves' and a candidate writes 'precipitate dissolves and a white solid forms', no mark can be awarded.

- When a question asks for a chemical equation, a word equation will not be accepted. The same applies for the name of a compound and formula of a compound.

PAPER OVERVIEW

The mean mark for this paper was 24 out of 50 marks.

The 2021 Chemistry paper consisted of 5 questions. Question 1 contained 10 multiple choice questions (MCQs) which focused on mainly AO1 and AO2 types of questions which required candidates to demonstrate their knowledge and application of essential scientific concepts. Question 2 and 3 included objective type questions as well as short-answer questions. Questions 4 and 5 included short-answer and open-ended questions that required candidates to demonstrate their scientific and inquiry skills acquired over Grade 9.

Table 2 provides details about the types of question and topics assessed.

Table 2

Question	Type of Question	Topic Assessed
1	10 Multiple Choice Questions	All Grade 9 Chemistry Topics
2	Labelling, short answered and open-ended	Mixtures and Separation techniques
3	Short answered	Language of Chemistry
4	Short answered and open-ended	Atmosphere and Environment around us
5	Short answered and open-ended	Reactivity of metals

GENERAL COMMENTS

In general, it was encouraging to see that many candidates were prepared for this examination. They had clearly revised the topics found in their syllabus. Most candidates showed a good grasp of the syllabus content and there was a range of correct responses for the open-ended questions. The knowledge-based items were generally well tackled by candidates. They started the paper well but found the last questions more challenging.

There was no evidence that any time constraints had led to candidates underperforming. Scripts where there was no response to the final question also had large sections of the paper which had not been tackled.

COMMENTS ON SPECIFIC QUESTIONS

Question 1

Question 1 consists of 10 multiple choice questions which ensured a broad coverage of the syllabus.

Table 1

Item Number	Key	Most common incorrect choice
a	**A**	**B**
b	**D**	**C**
c	**B**	**D**
d	**C**	**A**
e	**B**	**D**
f	**A**	**C**
g	**D**	**A**
h	**C**	**B**
i	**B**	**D**
j	**D**	**B**

This question was generally well attempted by most candidates. **Questions (a), (c), (d)** was correctly answered by most candidates. **Questions (e), (g) and (j)** revealed to be more challenging with only a few candidates obtaining the correct answer for **question (g)**.

The mean mark for this question was 6 out of 10.

Question (a)

A good number of candidates opted for respiration as the process that would produce oxygen. This clearly shows that candidates understood that combustion and lightning do not produce oxygen, but confused between photosynthesis and respiration. There seems to be a general misconception of associating photosynthesis with carbon dioxide.

Question (b)

Many candidates recognised that carbon dioxide is a harmful gas, but failed to understand that it cannot be converted into a harmless gas by the catalytic converter.

Question (c)

This was well answered by a majority of candidates.

Question (d)

A common incorrect answer was phosphorus. A possible reason could be the confusion between the elements phosphorus and potassium. Candidates could easily identify iodine and sulfur as non-metals.

Question (e)

A popular incorrect answer was iron (III) nitride. This shows that candidates could recognize that valency of the iron used in $Fe(NO_3)_3$ as 3. However, naming of radical seems to be the challenge in this question. Candidates need to understand that NO_3 is the nitrate radical and nitride refers to the nitrogen anion.

Question (f)

A common incorrect answer was P_6O_4. It seems that candidates were able to count the number of atoms for each element phosphorus and oxygen correctly. But, they applied unnecessarily the Criss- Cross method for formulae writing in this case. Candidates need to understand that when the displayed diagram is given, they are simply required to count the number of atoms and have it as subscript to the symbol of the element.

Question (g)

This was least well answered item in this question. Candidates should realise that when counting the number of atoms in a compound and when brackets are used, the small number at the bottom right of the brackets multiplies through what is in the brackets. A popular incorrect answer was **C**. Many candidates did not realise that the number of nitrogen atoms also has to be multiplied by 2.

Question (h)

Generally, this question was well answered.

Question (i)

Candidates recognised that boiling chips, as the name suggests, has to have an effect on boiling, but they were uncertain about the purpose of the boiling chips as ensuring smooth boiling during distillation.

Question (j)

Many candidates tend to answer such questions mechanically, thus explaining the choice of 'filtration' as the most common incorrect answer for obtaining pure water from seawater. Special attention should be drawn on the substance that needs to be obtained. Candidates also need to realise that methods of separation depend on the type of mixture provided.

Question 2

Part (a)(i) was generally well answered. Most candidates could identify 3 out of the four labelling correctly. The majority of the candidates struggled with the items on 'chromatography'. Identification of separation technique appeared to be a challenge for a significant number of candidates.

(a)(i) Candidates identified **A**, **C** and **D** correctly. The most common mistake was to identify **B** as sodium chloride. This question required candidates to understand that ammonium chloride sublimes where as sodium chloride does not.

   (ii) Many candidates failed to identify sublimation as the correct answer. The most popular incorrect answers were 'crystallisation' and 'decantation'. This suggests that they are able to recall the names of the different separation techniques, but failed to recognize them from a diagram.

(b) (i) Many candidates could easily identify chromatography as the technique depicted in the diagram.

   (ii) Very few candidates could identify the R as the solvent front.

   (iii) A significant number of candidates understood that the dyes in the ink   would interfere with the results of the chromatography.

   (iv) Many candidates failed to identify components in the mixture X and Y. Others wrote the number of components instead of the identity of the components.

Question 3

This question was on the topic 'Language of Chemistry' and revealed to be the least scoring question in this paper. Part (a) was less well done as compared to the other parts in this question. A large majority of candidates found completing a word equation more challenging that working with symbols and valencies.

(a) (i) Many candidates were able to give hydrochloric acid as correct answer, but there were responses such as 'chloric acid', 'hydrochloride', 'chlorine' which were quite popular incorrect answers.

   (ii) This was one of the least well answered questions on the paper. Candidates were required to include a base/alkali of sodium. The commonest incorrect answer was to opt for sodium. Candidates failed to recognise that the reaction between a metal and an acid will produce hydrogen and not water as product.

(b) A significant number of candidates could reach the correct the formula. Yet, writing formula remains a challenge for a majority of candidates.

(c) (i) Many did not realise that including a coefficient of 2 in the blanks provided will balance the equation. A minority of candidates gained the mark for this question.

   (ii) This had an approximately equal number of candidates arriving at the correct coefficient and incorrect coefficient. This is indicative of a high proportion of candidates guessing the answer.

Question 4

The question was on the topic 'The Atmosphere and Environment around us'. Parts **(a)(i), (a)(iii)** and **(c)(iii)** of this question were answered well by a majority of the candidates. Candidates showed that they had grasped basic graph reading technique. Some candidates confused between global warming and ozone depletion.

(a)(i) Most candidates performed well by identifying the maximum point as the point relating to the maximum concentration of oxides of nitrogen in the graph.

(ii) Whilst the majority of candidates could identify 10 am as the correct time when the concentration of oxides of nitrogen was highest, others could not score this mark as they mentioned 10 pm instead of 10 am. Being able to read the axes properly is an important skill that needs to be developed by candidates.

(iii) Candidates gave suitable source of oxides of nitrogen by mentioning 'internal combustion engines of vehicles' or 'exhaust pipes of vehicles. Others ignored that the question was about sources of oxides of nitrogen from human activities and hence no marks was awarded for answers such as 'lightning'.

(b)(i) Many candidates performed well and gave the correct answer by stating the importance of ozone layer**.**

(ii) This was a well answered question. Some candidates had difficulty to write 'chlorofluorocarbon' correctly. The short form of chlorofluorocarbon – CFCs - was awarded marks.

(iii) This part question was well answered in many cases. A range of answers related to skin and eye disease was accepted and a large majority of candidates scored their mark. Some answers were incorrect because they either referred to disease or cancer and were not sufficiently accurate.

(c) (i) Candidates answered this question well and the most common correct answer was fertilisers.

(ii) Candidates recognized that the process was eutrophication although there were misspelling mistake.

(iii) Better performing candidates realised that eutrophication leads to the death of aquatic organisms. A minority of candidates related the death of aquatic organisms to the presence of oil and plastic and they were not awarded mark for such answer.

Question 5

This question focussed on the reactivity of metals. Part **(a)(ii), (b)** and **(c)** proved to be most challenging to the majority of candidates. Many gave insufficient details when stating observations. Answers for part (c)(iii) were contradictory.

(a) (i) Many candidates were able to identify calcium as the most reactive and iron as the least reactive metal.

(ii) Candidates were required to relate their observations to the amount of bubbles of gas. A significant number gave vague answers. The most common incorrect answer was 'bubbles of air'. A common misconception was to confuse between bubbles of air and bubbles of gas. In this question, the metal was reacting with an acid and the gas hydrogen was produced.

(iii) A range of colours including green, pale green, yellow was accepted as the colour of the resulting solution.

(iv) Some candidates gave the correct order of reactivity but many reversed the order completely. Others seemed to rely on their existing knowledge of the reactivity series rather than using the information in the diagram. This question required candidates to use the diagrams and observation skills to reach conclusion about the reactivity of metals. Many candidates opted to recall the reactivity series in this case.

(b)(i) A minority of candidates were able to identify the correct colour change from blue to colourless. Others reversed the colours (from colourless to blue). Most candidates gained at least one mark for correctly identifying the colour of copper sulfate to be blue.

(ii) The correct answer, copper, was seldom seen. A popular answer was a pink/reddish brown solid, which was awarded mark. A common incorrect answer was 'residue'. There were some candidates who stated zinc sulfate as being the solid.

(iii) Relatively few candidates realised that the chemical reaction was a displacement one. Better performing candidates even explained that zinc displaced copper from its salt. It is noteworthy to point out that a significant number of candidates confused between 'naming the chemical reaction' and 'writing a chemical equation'. Hence, many candidates did not get credit by writing the chemical equation.

(c) (i) Many candidates gave suitable observations such as bubbles of gas being produced; sodium catches fire; sodium floats/darts on the surface but few gained both marks. The most common incorrect answer was 'very reactive'. Others wrote general comments about reactivity instead of giving observations.

(ii) Candidates provided some good responses showing that they understood about safety precautions. Accepted answers included wearing of goggles/lab coat/gloves. Often answers relating to the instructions given by the teacher were used as safety precautions.

(iii) A number of candidates missed the mark by mentioning that sodium does not react with paraffin oil. The expected response was sodium being a reactive metal will react with oxygen or water vapour in air.

(iv) Only a minority of candidates identified potassium as the correct answer. This question required candidates to reflect about those metals which are more reactive than sodium and consequently to realise that these metals will show similar reaction like sodium.