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NSC 2011 CHIEF MARKER'S REPORT

SUBJECT	PHYSICAL SCIENCES

PAPER	2

DATE OF EXAMINATION:	NOVEMBER 2011	DURATION:	3

SECTION 1:

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

• Responses vary from centre to centre. From poorly answered to
well answered. However, the majority of centres perform below expectations.
Everybody indicated that the paper was fair, with a few exceptions
(e.g. 1.5, 5.4, 6.7, 7.2.2, 8.8, 10,5)
• The language barrier still persists and learners failed to clearly express themselves.
• Organic chemistry in general remains a big concern in most centres. Some other areas
of concern include the use of Standard Reduction Potential table and Chemical
equilibrium.
• Higher order type questions created difficulties for many candidates.
• Strong candidates were also sometimes unsure exactly what was required from
them, hence long paragraphs were given.

SECTION 2:

Comment on candidates' performance in individual questions
(It is expected that a comment will be provided for each question on a separate sheet).

QUESTION 1
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
Most centres answered this question well. The only problems encountered here were in
questions 1.4 and 1.5.

(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions
Common mistakes found in this question includes the following:
1.1 The homologous series was incorrectly named, eg. halogens.
1.2 The terms used include hydrogen carbon bonds, hydrogen carbons.
1.3 Learners give the response as “equilibrium constants”.
1.4 This question was poorly answered. The response was either left out by a majority of
candidates or incorrectly given as bauxite.
1.5 Learners got confused with capacitance (for capacitors) and capacity.
(a) Provide suggestions for improvement in relation to Teaching and Learning
• Compile a data base of all one-word items from past NCS papers
• Teach and revise basic concepts and definitions on a regular basis.
(d) Describe any other specific observations relating to responses of learners
• The language and spelling of responses indicate that most learners struggle with
English as the language of teaching and learning
• The term capacity was confused with capacitance, even in traditionally stronger
centres.
• The sections on electrochemistry and electrolysis were not well taught
• The question must be raised whether the syllabus was completed in time in most
centres.
• Learners lack knowledge of basic concepts and definitions
e) Any other comments useful to teachers, subject advisors, teacher development etc.
• The subject advisors in each district must help educators in preparing a data base
of questions, with memorandums
• The answers on memoranda must include questions with explanations
• Concepts that are closely related must be carefully analysed and explained.
Reference here to concepts such as capacity and capacitance.
• Regular revision of definitions will benefit all learners
• Devise plans in the form of class tests or homework exercises to assess basic
concepts and definitions.
QUESTION 2
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
• This question was well answered by the majority of candidates.
• However, there were centres where the question was 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.
• Question 2.1 – 2.3 was well answered. The possibility of guess work cannot be
ruled out.
• In Question 2.4 candidates lack basic knowledge on reversible reactions.
• In Question 2.5 the Maxwell-Boltzman curve created problems, as it was not properly
understood.
• In Question 2.8, the use of negative statements confused many second language
learners

• In Question 2.9 and Question 2.10, learners struggled in answering these questions as the problem of understanding and reading the Standard Reduction Potential table still persists
(c) Provide suggestions for improvement in relation to Teaching and Learning
• Class tests and Control tests should always include multiple choice questions.
• Educators should develop the skills of answering multiple choice questions on a continuous basis.
(d) Describe any other specific observations relating to responses of learners
• Many learners clearly guessed the answers which was evident in the low marks obtained for their other questions.
• They lack the skills necessary in answering the multiple choice questions
• Skill in interpretation of graphs/ curves is lacking.
e) Any other comments useful to teachers, subject advisors, teacher development etc.
• Multiple-choice questions should be included in lesson planning and assessment
• Learners should be discouraged from guessing answers and be taught to rather use the process of elimination
• Intervention by subject advisors cannot be over-emphasised, especially in under- performing schools.
• Concepts such as oxidation, reduction , equilibrium and the use of the table of Standard Reduction Potentials should be introduced in Grade 10.
• District clusters should organise their own workshops and training sessions in topics where there are difficulties in understanding and teaching certain concepts.
QUESTION 3
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
• In general, responses to this question varied from poor to well-answered.
• The recall questions were answered well, but there are still some challenges with regard to IUPAC names, functional groups and writing of structural formulae.
• Questions that were poorly answered include Q 3.2.1 and Q 3.4.2.
(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
• Common mistakes include the omission of hyphens.
• Many learners give the answer as 2- methylpentanal.
• Learners could also not distinguish between the functional group and an example of carboxylic acids
• Carbon atoms are shown with more or less than four bonds in the structural formula
• Second language learners struggled with the spelling of “ester” (eg easter or esther)
(c) Provide suggestions for improvement in relation to Teaching and Learning
• Learners to get more practice in:
➢ writing out organic compounds and naming them.
➢ correctly using the I.U.P.A.C method
➢ distinguish between molecular, structural and condensed structural formulae
• Emphasize number of bonds on carbon atoms.
• The use of hyphens must be emphasized

(d) Describe any other specific observations relating to responses of learners
• Learners seem to be unsure of answers, hence they gave two responses
• There are also clear indication that Organic Chemistry is not well taught in some centres.
• The general impression is that learners' responses, with a few exceptions, have improved dramatically since 2008.
e) Any other comments useful to teachers, subject advisors, teacher development etc.
• More time should be spent on teaching Organic Chemistry.
• The identification of organic compounds must be well taught.
• Provide courses on the basics of the I.U.P.A.C nomenclature system to those educators who are struggling with/ or have a lack of knowledge in Organic Chemistry
• Class tests and remedial work should form an integral part of teaching and assessing Organic Chemistry
QUESTION 4
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
More than 75%of centres answered this question well. The questions that were poorly answered include Q.4.2 and Q.4.5.1.
(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.4.2, learners could not identify the dependent and/or independent variables.
• Learners guessed the structural formula of the isomer. Most learners gave the straight chain instead of the branched chain.
• In Q4.6, candidates relate, incorrectly, high vapour pressures to high boiling points.
• The physical properties of organic compounds is not clearly understood.
• Many learners struggled with the concept "saturated" and/or "unsaturated".
(c) Provide suggestions for improvement in relation to Teaching and Learning
• Learners should be exposed to practical investigations as early as grade 8 and 9. They must be made aware of terms such as variables (dependent, independent, controlled), hypothesis and investigative questions.
• Use the examination guidelines to familiarise learners with important concepts such as Structural formula, isomers, boiling point, viscosity, vapour pressure.
• Relate intermolecular forces to structural formulae and boiling points.
(d) Describe any other specific observations relating to responses of learners
• Incorrect spelling by huge percentage of candidates.
• The use of phrase "one bond" instead of single bond.
• They draw any structural formula with five carbon atoms.
• Incorrectly relating higher intermolecular forces with branching.
• Many learners' responses were sometimes vague. Examples include "structure has low energy, energy of alkane is low.

(e) Any other comments useful to teachers, subject advisors, teacher development etc.
• More time should be spent on teaching basic organic chemistry, before addressing the physical properties of compounds.
• Teachers should always consult the examination guidelines and content documents, and not rely only on text books.
• Whenever possible, practical investigations/demonstrations must be carried out.
• Subject specialists and leading physical sciences educators should run workshops in order to help the educators to eradicate misconceptions regarding organic chemistry concepts.
QUESTION 5
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
• Performances ranged from poor to excellent in most questions, except Q.5.4.
• Q.5.1 was well answered, although it appears that some learners guessed the answers.
(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
Q.5.4 was poorly answered mainly due to the fact that learners could not understand the
phrase “reaction conditions”.
The responses that appeared included catalysts, ultraviolet light, sunlight, high temperature
and flux with KOH.
(c) Provide suggestions for improvement in relation to Teaching and Learning
• Reaction conditions should be thoroughly dealt with.
• Clearer guidelines could make the teaching of this concept easier.
(d) Describe any other specific observations relating to responses of learners
• Instead of “low heat” learners wrote “low temperature” in Q.5.4.
• The –OH group in Q.5.2 is on the last carbon (Markovnikovs’ rule)
• There are more than four bonds on a carbon atom.
• Learners are not following instructions, e.g. when asked to give structural formula,they respond by giving condensed, semi-condensed or molecular formula.
• Carelessness from learners, e.g. propa-2-nol, 2propanol, prop-2-ol.
• Some organic equations were given without any arrows.
e) Any other comments useful to teachers, subject advisors, teacher development etc.
• Teachers should refer to the examination guidelines. They should not rely on textbooks which often deal with certain topics incorrectly or scantily.
• Practical investigations should include organic reactions (depending on the availability of resources).
• Teaching strategies must be shared amongst educators.
• Workshops on the Examiner’s report (and memo discussions) must be held as soon as it comes available.
• Teacher development programmes should deal with content currently in the syllabi.
• Introduce organic reactions in Grade 11 and adjust examination guidelines accordingly.

QUESTION 6
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
• In general this question was poorly to fairly well answered. However, learners in some centres scored maximum marks.
(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
• Q.6.1: Learners missed the concept of a graduated container, allowing measurements.
• Q.6.2: Reading of data from graphs seems to be problematic.
• Q.6.3: Learners could not explain their respective responses relative to the graph.
• Q.6.5: Learners rewrote the equation instead of the formulae.
• Q.6.6: The question seems to be unfair to learners because of the confusion between catalyst action and surface area.
• Q.6.7: Learners could not use the information given to answer the question.
(c) Provide suggestions for improvement in relation to Teaching and Learning
• When doing practical investigations on rate of reaction, more time should be allocated to drawing and/or interpretation on graphs.
• Expose the learners to reading and interpretation of a scientific nature/data.
• The collision theory in respect of rate of reaction should be done in more detail.
(d) Describe any other specific observations relating to responses of learners
• Learners omitted the words “marked/graduated/measuring” in Q.6.1.
• Different values were read off the graph and incorrect units given.
• The phrase “decompose hydrogen peroxide” was taken directly from the question (Q.6.4).
• In Q.6.5, the equation was given.
• Learners misinterpreted the question. Responses were not given in terms of the collision theory (Q.6.6). the graph per unit time was not included in their responses.
• In Q.6.7, learners thought that is caused by bacteria themselves decomposing.
e) Any other comments useful to teachers, subject advisors, teacher development etc.
• Educators should use articles from scientific magazines to set up tests/assignments. This will give the learners the opportunity to develop their skills in interpretation and application.
• Cluster meetings could be arranged to discuss areas of concern with respect to rate of reaction and collision theory.
• District officials must make sure that the examination guidelines be dispatched to all schools, especially when new concepts are included.
• As this section of the syllabus involve many practical investigations, subject advisors can assist by setting up common tasks and where needed, supply the minimum resources required.

QUESTION 7
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
• This question was fairly well answered.
• More than 50% of the candidates scored more than 8 out of 17.
• The K_c-calculation was easier than past papers and many learners achieved at least 4 out of 8.
• Problems still however persist in questions where they have to apply Le Chatelier's Principle, and factors affecting equilibrium contant.
(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.7.1.1 learners lost marks by omitting key words per memorandum.
• In Q.7.1.2, 7.1.3 and 7.2.2, many learners find it difficult to answer questions where they had apply Le Chatelier's Principle.
• In Q.7.2.2, candidates were also unsure of which reaction the question referred to. This can also be attributed to language barriers.
(c) Provide suggestions for improvement in relation to Teaching and Learning
• Learners must be given a variety of K_c examples to practice so that they can study this section with understanding.
• Equip educators with the necessary confidence to teach this section by doing in-service training. Correct scientific terminology and methods must be ensured.
• Educators should be equipped with a copy of the marking guidelines.
(d) Describe any other specific observations relating to responses of learners
• Learners omitting the key words then stating Le Chatelier's Principle.
• The K_c-calculation was done with 3 columns instead of 4. The learners combined The H_2O and CO columns.
• The wrong assumption was made that the initial concentration of H_2 and CO_2 were equal.
• Learners writing incorrect K_c expressions.
e) Any other comments useful to teachers, subject advisors, teacher development etc.
• Expose learners to a variety of questions on equilibrium calculations.
• Methodology in teaching K_c should be devised and implemented. This means that the learner must be able to use the table, and show the steps involved in the allocation of marks.
• A mentoring system should be put in place where experienced educators guide the less experienced ones through rate of reaction, equilibrium, factors involving K_c-calculation and how K_c is affected (or not) by changing conditions.
• Make use of the media and internet (if available) to obtain as much as possible material on the topics mentioned above.

QUESTION 8

QUESTION 9

(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
• The learners clearly lack understanding on the operation of the membrane cell.
• The diagram in the question paper differs from the one given in most textbooks.
This confused many learners.
• Many candidates could not write the overall cell reaction.
• In Q.10.5 learners made the wrong assumption regarding the gases released in the
chlor-alkali industry. They did not refer to the energy needed.
(c) Provide suggestions for improvement in relation to Teaching and Learning
• Make use of the available DVD's on this topic.
• Diagrams need to be switched around as often as possible, as many learners just
learn in terms of left or right.
• Link the chlor-alkali industry with electrochemistry as early as possible in the year.
• The proper use of the Standard Reduction Potential table cannot be
overemphasised.
(d) Describe any other specific observations relating to responses of learners
• Learners confused the function of the salt bridge with that of the membrane cell,
e.g. "separate the half-cells".
• Learners switched the anode and cathode.
• When using formulae learners' responses included H (for H_2) or Cl (for Cl_2).
• In Q10.5 learners wrote "It releases CO_2 into the atmosphere". No reference
was made to the generation of electricity.
e) Any other comments useful to teachers, subject advisors, teacher development etc.
• Teach this section of the syllabus in conjunction with electrochemistry and
electrolysis as early as possible.
• Do regular revision exercises on these topics, using the Standard Reduction
Potential table.
• Identify underperforming schools in this section and devise and implement
intervention programs.
• The current information regarding gases causing global warming should be given to
all schools. Many textbooks confuse the hole in the ozone layer with global
warming.
QUESTION 11
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
• This question was fairly-well answered by most centres. Responses range fairly-well
answered to well answered.
• Q.11.3 and 11.4 were not answered well.

(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
• Learners could not balance the equation in Q.11.1.2 and 11.3.
• Learners were unable to add O_2 to the equation.
• Many learners struggled with the calculations; they arrived at the right mass using incorrect formula or methods
e.g. 3/30 x 100 = 10%
10% of 50 = 5kg
• Q.11.5 was deemed to be unfair as it only asked one negative impact, but an explanation was expected as response.
(c) Provide suggestions for improvement in relation to Teaching and Learning
• Try to include more flow-diagram questions in your assessments.
• Learners should be taught about the cause and effect of eutrophication.
• Balancing of chemical equations should be taught in earlier grades. (GET phase)
• Teach learners the correct spelling of names of processes.
(d) Describe any other specific observations relating to responses of learners
• The incorrect spelling of “Ostwald”, e.g. Austwald.
• Learners struggle to balance equations in Q.11.1.2 and 11.3.
• The response in 11.2 was often given in an equation.(as in memorandum)
• Strange formulae used in calculating the mass of the fertilizer
e.g. Mass of N = composition of N / mass of total composition x mass of fertilizer
• The cause or effect was not clearly stated e.g. only fish die. Learners struggled to express themselves.
e) Any other comments useful to teachers, subject advisors, teacher development etc.
• Manage your time so as to complete your syllabus timorously. Time should be spent on revision.
• Concepts not familiar to you and your learners should be thoroughly researched.
• More updated exemplars should be made available to all schools.
• Workshops on specific subject matter/content must be conducted to equip less experienced educator with the necessary skills and confidence to tackle all concepts.

SIGNATURE OF CHIEF MARKER: _____