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NSC 2011 CHIEF MARKER'S REPORT

SUBJECT	PHYSICAL SCIENCES

PAPER	ONE

DATE OF EXAMINATION:	11 / 11 /2011	DURATION:	3 HOURS

SECTION 1:

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

35.4%

Performing schools did well.
There is a marked improvement in the marks of the performing schools with many more levels 5 to 7 as is evident from the statistical analysis.
Poor performing schools still performed poorly.

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 – 40%

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

- *Fair. The questions were well answered by many learners.*

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

- *With only five questions covering the whole curriculum, it is difficult to do well if everything is not covered in class.*
- *There is no specific reason why this question was not well answered, because learners from performing schools managed to give the correct answers, but learners from poor performing schools haven't done well, especially in questions 1.2 and 1.3. This indicates that these learners are not taught well or do not learn.*
- *From the responses the impression is that learners guess the answers or just write anything that comes to mind.*
- *Many learners wrote "alternative current" instead of alternating current in question 1.4.*

(a) Provide suggestions for improvement in relation to Teaching and Learning.
• *Educators must make time for revision before any examination.* • *More attention must be given to explaining and learning of concepts, rules, definitions, units and their symbols.* • *Regular class tests must be written on the above.*
(d) Describe any other specific observations relating to responses of learners.
• *Learners do not learn basic concepts and definitions.* • *Many learners are not familiar with some of the terms given in question 1, confusing them with other terms or concepts.*
e) Any other comments useful to teachers, subject advisors, teacher development etc.
• *Give the learners a list of definitions, rules and concepts to learn and test them daily by means of short tests and class quizzes.*
QUESTION 2 – 39%
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
• *The performance ranged from zero to full marks, with questions 2.1, 2.5 and 2.7 obtaining the best results, while questions 2.3, 2.6 and 2.8 obtained the least correct responses.*
(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
• *Learners are not taught the skills required to answer multiple choice questions.* • *Teachers concentrate on longer questions and do not include multiple choice questions in tests and internal examination papers.* • *A lack of ability to analyze questions and apply basic knowledge is evident in questions 2.3, 2.6 and 2.8.*
(c) Provide suggestions for improvement in relation to Teaching and Learning.
• *Learners must be taught the skills required to answer multiple choice questions.* • *Educators must provide the learners with sufficient examples to practice these skills in formal and informal assessment tasks.*
(d) Describe any other specific observations relating to responses of learners.
• *It is evident from the answers given that there are still many learners who guess the answer.*
e) Any other comments useful to teachers, subject advisors, teacher development etc.
• *Teachers can use one-word and multiple choice questions for science competitions and quizzes in the classroom.* • *Learners must be taught to answer multiple choice questions and be discouraged from merely guessing the answer by making them provide the calculation and/or explanation leading to their choice of the letter in their answers.*

QUESTION 3 – 28%

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

- *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.

- *Many candidates confused the signs (+ and -) for the vertical motion (question 3.2) and substituted incorrectly into the equation* $\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$. *Both "* Δx*" and "a" (g) should have the same sign.*
- *Learners failed to understand the question and could not link the horizontal displacement or time to the vertical fall of the camera in question 3.4.*
- *Most of the candidates couldn't translate the data to the graph in question 3.3.*
- *There is still a lack of understanding of the difference between constant velocity (a = 0* ms^{-2}*) and accelerated motion.*
- *Learners used "g" randomly although it only applies to vertical motion.*

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

- *Better revision of grade 11 work must be done in grade 12.*
- *Emphasize the importance of using correct signs (+ and -) to indicate direction.*
- *Teach the learners to draw graphs and do more exercises relating to graphs.*
- *Teach learners the similarities and differences between vertical and horizontal motion.*
- *Learners must be provided with data sheets and taught to use them correctly throughout the year.*

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

- *Most learners did not use rulers when drawing graphs and other diagrams.*
- *Learners who tried to use different equations to calculate the answer in 3.2 only succeeded in calculating what was already given which indicates a lack of insight and proper use of the data sheet.*
- *There is a lack of a uniform technique to represent information graphically.*

e) Any other comments useful to teachers, subject advisors, teacher development etc.

- *Promote the use of the Cartesian Plane in drawing graphs. This will promote a uniform approach to the sign convention (+ or -) and improve the quality of the graphs and subsequent calculations.*
- *All motion related graphs must be revised as a unit so that teachers can point out differences and similarities (e.g. gradient and area of graphs) to learners.*

QUESTION 4 – 36 %

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

- *The learners didn't perform well, especially in questions 4.1, 4.2 and 4.5.*
- *Question 4.4 was generally well 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 4.1 and 4.2 it is clear that the topic on frames of reference was not taught by most teachers.*
- *In 4.4 the omission of the direction (momentum as a vector) led to most candidates losing marks.*
- *In 4.5 many learners used the correct equation but substituted the 85000 N indicating that they didn't interpret the question correctly.*
- *Many learners left out the **net** in $F_{net} = \Delta p$ and lost one mark.*

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

- *Learners need to be taught to distinguish between conservation of momentum and change in momentum and the relevance of direction as they are working with vectors.*
- *Learners must be taught the proper way of writing out the expression for conservation of momentum i.e. $m_1v_{1i} + m_2v_{2i} = m_1\ v_{1f} + m_2\ v_{2f}$ as this does not appear on the data sheet.*

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

- *Wrong use of formulae and units is still a major problem.*
- *Many learners are still confusing the concepts of conservation of mechanical energy with the principle of conservation of momentum.*
- *Learners are not taught to use the data sheet correctly.*

e) Any other comments useful to teachers, subject advisors, teacher development etc.

- *This is grade 11 work that is examined in grade 12 and teachers must ensure that it is thoroughly revised before any examination.*
- *This work must be included in all assessment tasks in grade 12.*
- *More multi-step and higher-order questions integrating conservation of energy, conservation of momentum and impulse must be introduced at grade 11 level.*
- *Teach learners to copy the appropriate formula correctly from the data sheet.*

QUESTION 5 - 22 %

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

- *The performance in this question is the second lowest for the paper.*

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

- *Most learners lack a basic understanding of vectors and the work-energy theorem.*
- *The inability of learners to draw a free body diagram and provide correct labels with direction in question 5.4 resulted in learners not attempting or not being able to fully answer it.*
- *In question 5.4 learners also failed to summate the work done by each force and equate it to the change in kinetic energy e.g. ($W_f + W_G + W_F = \Delta K$)*
- *Learners lost one mark for not using the subscript "**net**" in $W_{net} = \Delta K$.*
- *Learners lost three marks for not using the work-energy equation ($W_{net} = \Delta K$)as instructed in the paper in question 5.4.*

(c) Provide suggestions for improvement in relation to Teaching and Learning
• *Questions that focus on free body diagrams, selection of equations and the correct substitutions the direction of forces must be practiced by learners.* • *Learners must get more practice writing equations to calculate F_{net}. This will assist them in writing out expressions for W_{net}.* • *Drawing of rough sketches will help to form a clear picture of the situation described.* • *Learners must be taught to use the data sheet correctly.*
(d) Describe any other specific observations relating to responses of learners
• *Many educators do not understand or cannot apply the work-energy theorem.* • *Free body diagrams are done in grade 11 with no thorough revision in grade 12.* • *Learners don't identify work as a scalar quantity and therefore incorrectly allocate direction to the numerical value which leads to them losing marks.* • *Many learners are still attempting to answer questions on $W_{net} = \Delta K$ by calculating the work done by the different forces separately. This approach must be discouraged.*
e) Any other comments useful to teachers, subject advisors, teacher development etc.
• *Work-energy theorem is still a problem even amongst the teachers.* • *Subject Advisors/Planner must conduct workshops on the work-energy theorem.* • *Teachers can also discuss this topic in cluster meetings.*
QUESTION 6 – 63 %
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
• *This was the best answered question except for question 6.4 (2 marks).*
(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
• *In question 6.2 some learners did not substitute correctly i.e. they substituted the value for f_S into f_L .* • *In the application of the Doppler Effect in 6.4 learners struggled to express themselves correctly, as they didn't consider the effect of relativity of velocity changing pitch.*
(c) Provide suggestions for improvement in relation to Teaching and Learning
• *Relative velocity must be taught / revised before teaching the Doppler Effect.*
(d) Describe any other specific observations relating to responses of learners
• *The good performance in the calculation in 6.2 can be attributed to the selection of the correct formula and direct substitution into the formula. Changing the subject of the formula was not required.*
e) Any other comments useful to teachers, subject advisors, teacher development etc.
• *The equation on the data sheet must be used as given, not abbreviated or shortened.* • *Teachers must regularly test the learners calculator skill, as the incorrect use of the calculator resulted in many learners losing marks.*

QUESTION 7 – 52 %
(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. (Second best)*
(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
• *Some learners struggled to see the difference between dependent and independent variables.* • *In phrasing the investigative question in 7.2 where the dependent and independent variables must be included, the learners did not use the information given in the question.* • *The mark for the final answer in question 7.5 was lost in many cases due to learners not being able to use their calculators to determine □ from sin □.*
(c) Provide suggestions for improvement in relation to Teaching and Learning
• *More LO1 type questions must be included in formal and informal assessments during the year.*
(d) Describe any other specific observations relating to responses of learners
• *Learners generally struggle to identify variables.* • *As there was no need to change the subject of the formula for 7.5 many learners scored full marks (5) for the question.*
e) Any other comments useful to teachers, subject advisors, teacher development etc.
• *The formulation of investigative questions must be practiced verbally in class.* • *The questions used in practical work must follow the same format as the questions for LO 1 in final examination papers to enable learners to get used to this type of questioning.* • *Educators must do the practical work prescribed in the curriculum.* • *Educators must use simulations in the teaching of all the work on "light". These simulations are freely available on the internet.*
QUESTION 8 – 19 %
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
• *Poorly answered due mainly to errors in calculations.* • *Question 8.4 is a higher order question which was well answered by the brighter learners.*
(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
• *Few learners showed a real understanding of static electricity and the appropriate formulae that must be selected to answer a specific question.* • *Most learners have no idea of how to calculate charge gained or lost in question 8.2.* • *They used equations such as Coulomb's Law or F = QE to try to get to an answer.* • *Most learners could calculate the new charge in 8.2 but didn't know that the new charge must be substituted into 8.4 and not the charge lost, effectively losing 2 marks.* • *Many learners subtracted the forces incorrectly in 8.4 and forfeited the mark for the final answer.* • *The direction of the net force was seldom given correctly.*

(c) Provide suggestions for improvement in relation to Teaching and Learning
• *Revision of grade 11 work is required.* • *Clear distinction must be made between electric fields and electric forces. E_{net} □ F_{net}* • *Forces and electric fields are vectors and the direction must be included in the final answer.*
(d) Describe any other specific observations relating to responses of learners
• *Learners do not understand the basics of static electricity.* • *They fail to identify the direction of the transfer of electrons and the associated change in the charges.* • *Many learners made calculation errors as their calculator skills are poor. The marks lost are wasted marks.* • *The use of capacitor equations in this question clearly indicates that this topic is not taught in some schools.*
e) Any other comments useful to teachers, subject advisors, teacher development etc.
• *The basics of static electricity must be entrenched in grade 9 + 10 and revised in grade 11 before starting grade11 work.* • *Attention must be given to developing sound calculator skills at the beginning of the year.* • *Encourage learners to make rough sketches of the information provided in the question as this helps to understand the question.*
QUESTION 9 – 24 %
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
• *Generally this easy 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.
• *Learners struggled to interpret the graph and failed in most cases to translate information from the graph to give the co-ordinates in 9.2.1.* • *A common error was the inability to read the values off the axis according to the scale given.* • *The point identified had the co-ordinates (4; 0,64), which were mostly given as (4;0,6) or something totally irrelevant.*
(c) Provide suggestions for improvement in relation to Teaching and Learning
• *Learners must be taught that a graph is just another way of representing information.* • *The skill to use graphs to show trends or relationships between variables must be taught at the beginning of the year and revised and applied regularly as required by the content.*
(d) Describe any other specific observations relating to responses of learners
• *Learners do not understand graphs and the role graphs play in presenting information or data.* • *Learners who couldn't calculate the gradient of the graph succeeded in calculating the resistance asked in 9.3 by using Ohm's Law.*