Province of the
EASTERN CAPE
EDUCATION

ASSESSMENT AND EXAMINATIONS DIRECTORATE
Bundy Park, Private Bag 4571, King William's Town, 5600
REPUBLIC OF SOUTH AFRICA, Website: www.ecdoe.gov.za

NSC 2016 CHIEF MARKER'S REPORT

SUBJECT	PHYSICAL SCIENCES

PAPER	1

DATE OF EXAMINATION:	4 NOVEMBER 2016	DURATION:	3 HOURS

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

- Generally, learners performed is poorly, the pass rate overall is 48%. The average mark overall is approximately 30%.

LEVEL RATING	PERCENTAGE
1	52
2	19,4
3	12,6
4	7,8
5	4,4
6	2,5
7	1,4

- The quality of results is not encouraging. 16,1% of the learners obtained level 4 to 7. This indicates that only 16,1% of the learners who sat for the 2016 NSC in the Eastern cape qualify to be admitted into the Universities.
- The question paper was of good standard. The cognitive levels were balanced as per the CAPS Policy document.

COGNITIVE LEVELS	% as per CAPS Policy document	% as per question paper
1	22,5	25
2	52,5	51
3	60	59
4	15	15

Content is covered as prescribed in CAPS Policy document. Well balanced per content.

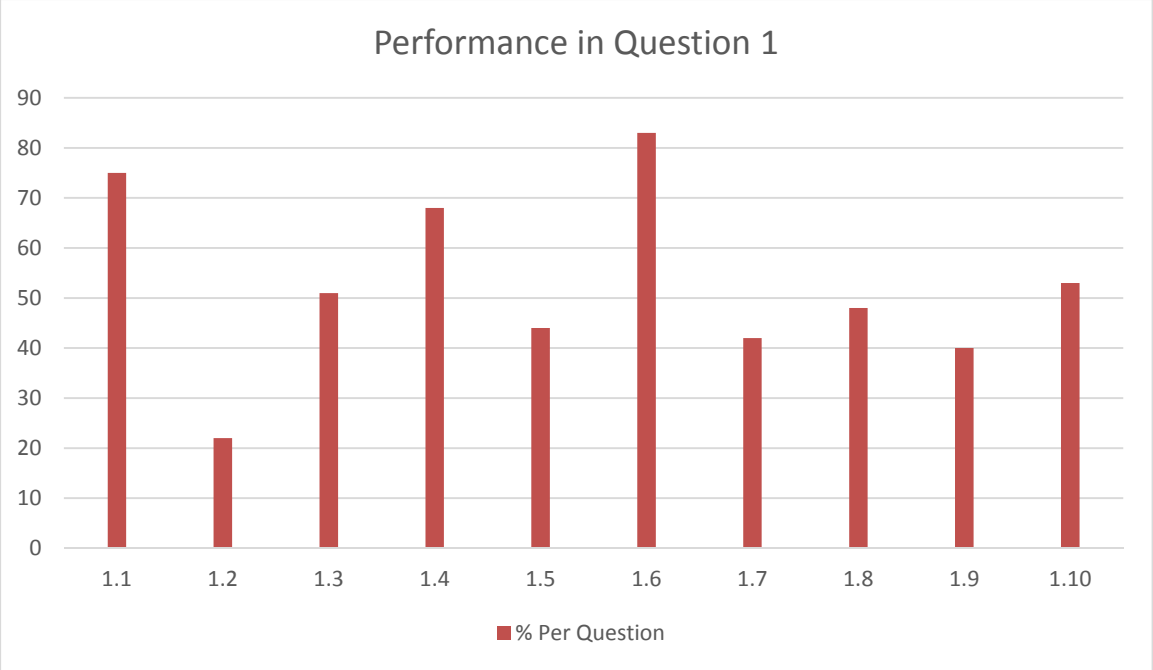
CONTENT	AS PER POLICY	AS PER PAPER
MECHANICS	63	65
WAVES, SOUND & LIGHT	17	15
ELECTRICITY & MAGNETISM	55	55
MATTER & MATERIALS	15	15

It was expected that learners will perform well in the question paper but unfortunately, they performed poorly from both the analysis of the pre-marking and the seven-point scale.
The possible reasons and suggestions for improvement are outlined in the questions analysis in section 2 below.

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?



- Learners performed fairly in question 1. Question 1.2 was the worst performed question. 1.5, 1.7, 1.8 and 1.9 were also poorly answered.

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

- Learners did not take their time to read these questions carefully. Thus, they misunderstood the questions which led to them choosing the wrong option.
- 1.5 if learners did read carefully they will see that there were only two options that they could choose from. That is B and C.

- 1.7 learner lack the ability to interpret directions correctly in electric field.
- 1.8 the interpretation of graphs is still a problem to learners. Most learners choose option C, which indicates their lack of understanding in relating the dependent and independent variables and to the interpretation of the gradient.
- 1.9 learners misunderstood the question. Those learners who answered wrongly chose option A. The possible explanation could be that these learners were thinking of the current in a circuit and not emf of a generator. Thus, they opted for A, which is decrease the resistance.

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

- Learners need to be taught how the answer multiple choice questions. That is by eliminating the wrong options with reasons to get the correct option. During revision teachers, must not just focus on the structured question only but should also drill learners in these multiple-choice questions.

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

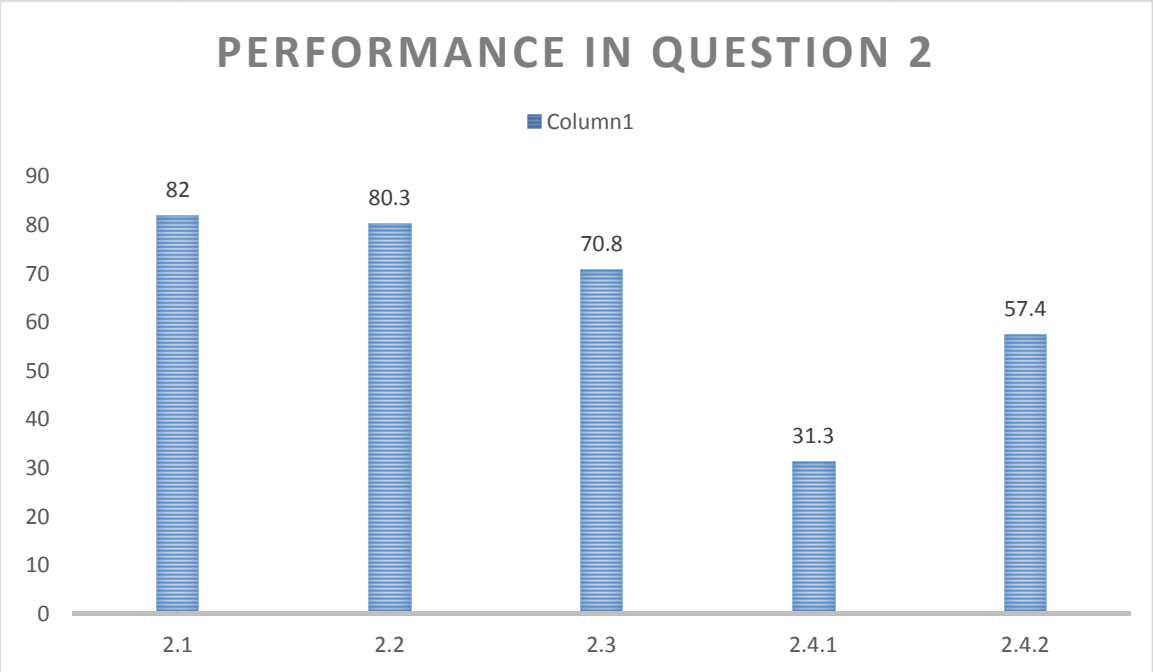
- Lack of reading skills could have cause the misunderstanding and misinterpretation of questions leading to poor performance. Example 1.5, the length of the question will put off a poor reader to just choose any option without reading.

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

- A booklet on multiple choice questions may be developed. This booklet may cover among others necessary skills on answering these kinds of questions and various forms of questions such as assessing learners to establish relationships and trends in situations where many quantities are involved, analysis and interpretation of graphs and to recall concepts in as far as definitions are concerned.

QUESTION 2

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



- Learners performed well in question 2. Question 2.4.1 was the was poorly answered.
- 2.1 and 2.2 were the best answered among the all the questions. Most learners could draw at least the free body diagram, few learners drew a force diagram.

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

- In 2.4.1 Most Learners could not calculate the normal force on the object which then led to the wrong calculation of the frictional force. They are unable to calculate the normal force when an object is moving on a horizontal surface with the applied force acting at an angle to the horizontal.

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

- Teachers must work many examples with learners on different scenarios

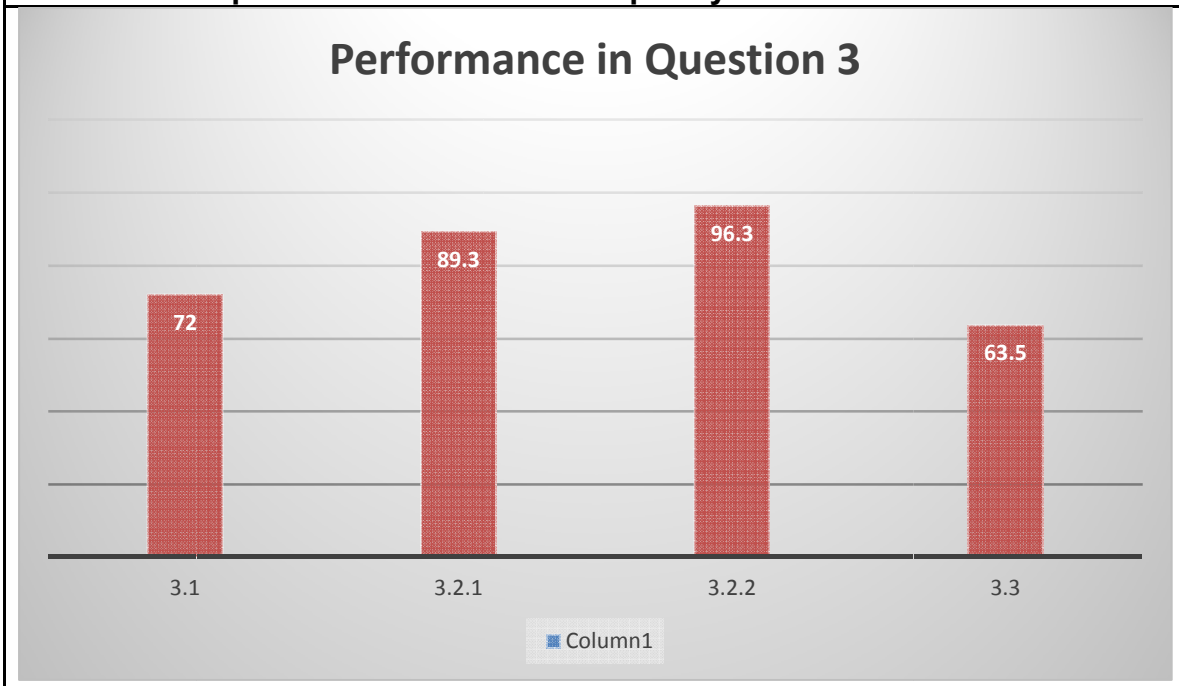
1 When an object is moving on a horizontal surface with applied force horizontal.
2 When an object is moving on a horizontal surface with applied force inclined at an angle to the horizontal and upwards.
3 When an object is moving on a horizontal surface with applied force inclined at an angle to the horizontal and downwards.
4 When an object is moving on an inclined surface with applied force along the inclined.

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

- There was an indication that Newton's law two is taught well at school. All learners attempted question.

(e) Any other comments useful to teachers, subject advisors, teacher development etc.
• More emphasis should be put on the calculation of normal force 2.4.2 teachers need to teach learners how to identify forces acting on a given object and those that add algebraically to give the net force.

QUESTION 3
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?

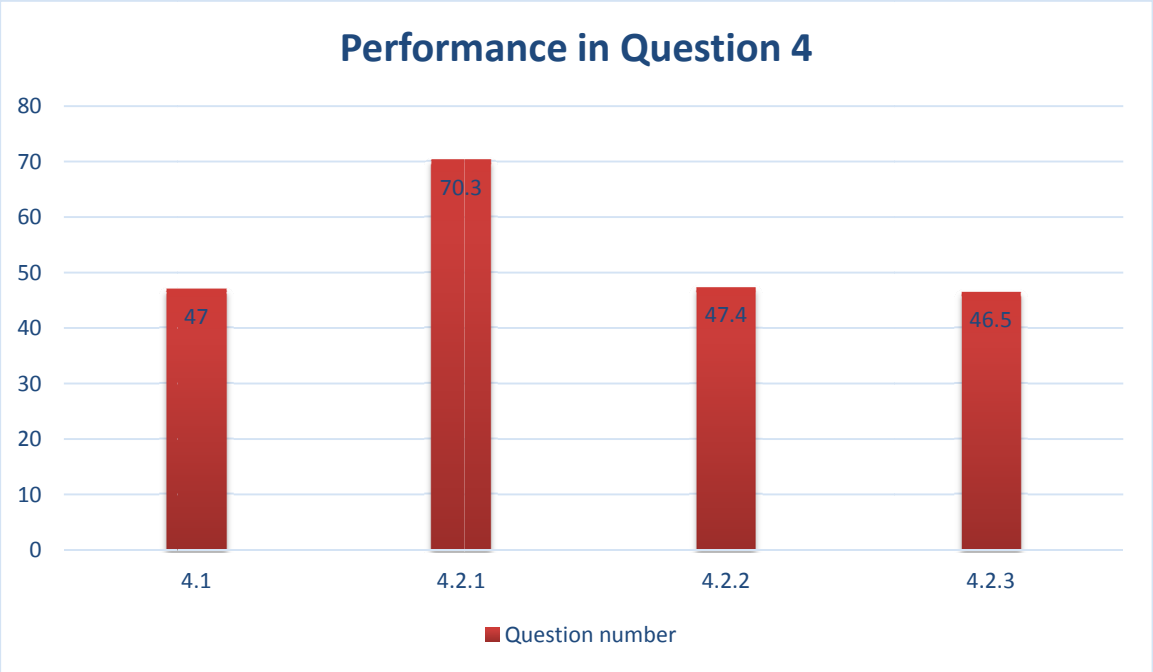


- This question was the best answered among all the questions. 3.2.2 almost every learner answered correctly. However, 3.1 not all learners got this question right.

(b) Why was the question poorly answered? Also, provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
• Learners turn to neglect definitions when revising. Most of them omitted the word, ”only” from the definition which led to the loss of the two marks.
(c) Provide suggestions for improvement in relation to Teaching and Learning
• Teachers must encourage learners to memorize definition, principles and laws as stated in the exam guidelines.
(d) Describe any other specific observations relating to responses of learners
• Learners could answer level 2 questions on Vertical Projectile Motion.
(e) Any other comments useful to teachers, subject advisors, teacher development etc.
• Equal importance should be placed on the level 1 questions just as any other cognitive level question.

QUESTION 4

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



- Learners performed fairly in this question. 4.2.1 was the best answered among the sub questions of question 4. 4.1, 4.2.2 and 4.2.3 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.

- Learners turn to neglect definitions when revising. Thus, they could not define an isolated system. For 4.2.2 and 4.2.3 the ability of learners to interpret graphs was again the cause of the poor performance in these sub questions.

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

- Teacher should teach all aspects of momentum and impulse including graphs such as F_{net} verses time and Momentum verses time. The interpretation of the graphs such as area under the graph for F_{net} verses time as the impulse and gradient of the Momentum verses time as the F_{net}.

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

- Some learners wrote the formula for change in momentum but substituted initial momentum only. In 4.2.2 some learners could not write the correct formula for the conservation of linear momentum. The considered of the two objects after the collision as if they coupled.

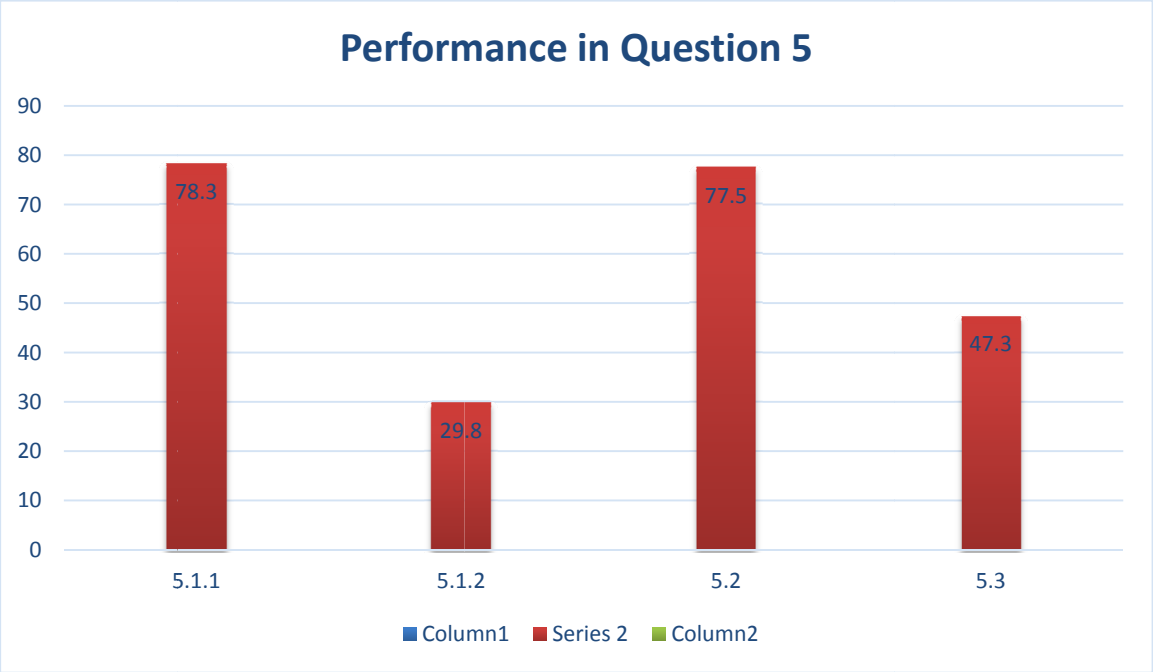
(e) Any other comments useful to teachers, subject advisors, teacher development etc.

- In teaching momentum and impulse, the different types of collisions should be emphasized to learners.

1 Same initial velocity and different final velocities. (explosions)
2 Different initial velocity and same final velocities.
3 Different initial velocity and different final velocities.

QUESTION 5

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



- This question was fairly answered 53,7% per the rash analysis. The worst question under question 5 was 5.1.2 with 29,8% and 5.3 was not well answered too at 47,3%. 5.1.1 was well answered at 78,3%.

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

- 5.1.2 Learners lack understanding of conservation of mechanical energy when two or more objects are involved. Hence, they applied the principle wrongly. Most of the learners considered one object resulting in a wrong answer.
- 5.3 Applying energy principles on an inclined is still a challenge to most learners. Failure to relate the net work done to the sum of work done by all forces acting on the object led to most learners to wrong answers,

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

- Teachers must teach all aspects of conservation of mechanical energy. Especially applying ME lost by one object is equal to ME energy gained by the other object in an isolated system.
- In teaching, teachers should assist learners to understand Net as the SUM. Eg net force algebraic sum of all forces. Net work done sum of all work done. Net electric field algebraic sum of all electric fields at that point.

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

- 5.1.2 learners demonstrated an idea of the conservation of mechanical energy correctly, such as ME before is equal to ME after, but then failed to apply the principle to the two objects.
- 5.2 Learners who use the formula for work energy theorem could calculate the

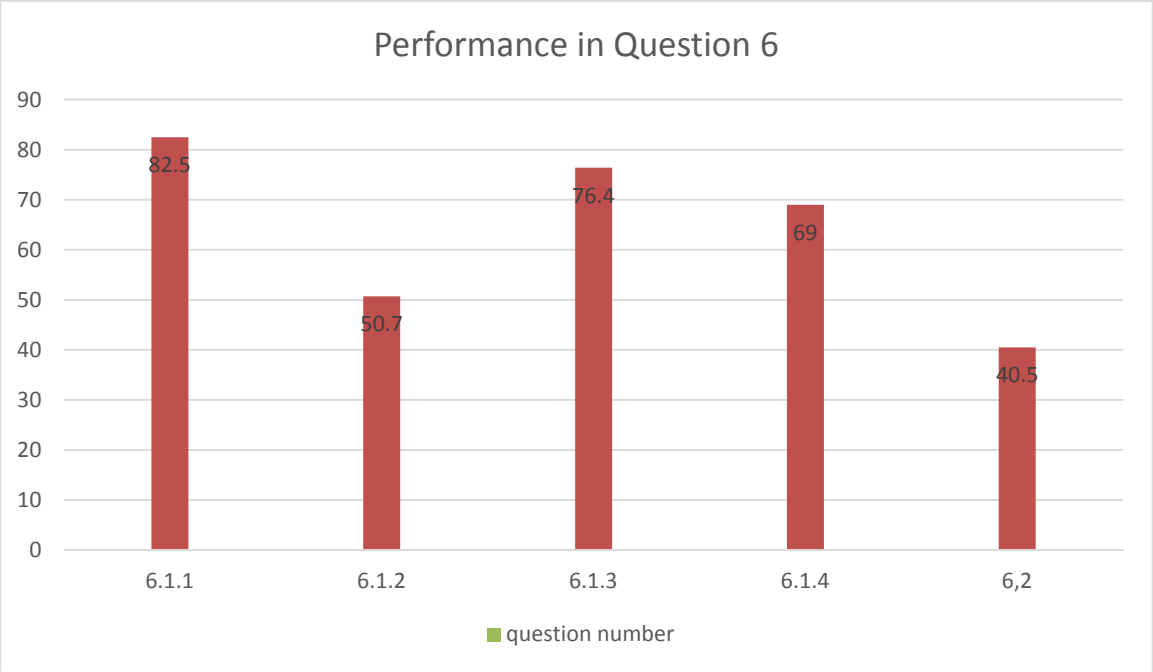
change in kinetic energy, expressed the net work done in terms of the net force which was not given.

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

- 5.2 was definition again not all learners got it right. Steps in teaching should be to begin with cognitive level 1 questions in each topic and emphasize the importance of the level 1 questions as the question paper contains at least 22% of level 1 questions as per the Policy documents.

QUESTION 6

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



- Learners scored more marks in this question. It was the next well answered question after question 3 at 65,3% as per the rash analysis. 6.1.1 very well answered only few leaners did not get it right due lack of language in expressing the relative motion between the source of sound and the observer. Most learners also got 6.1.3 right at 76,4%. They could apply the Doppler effect formula correctly.

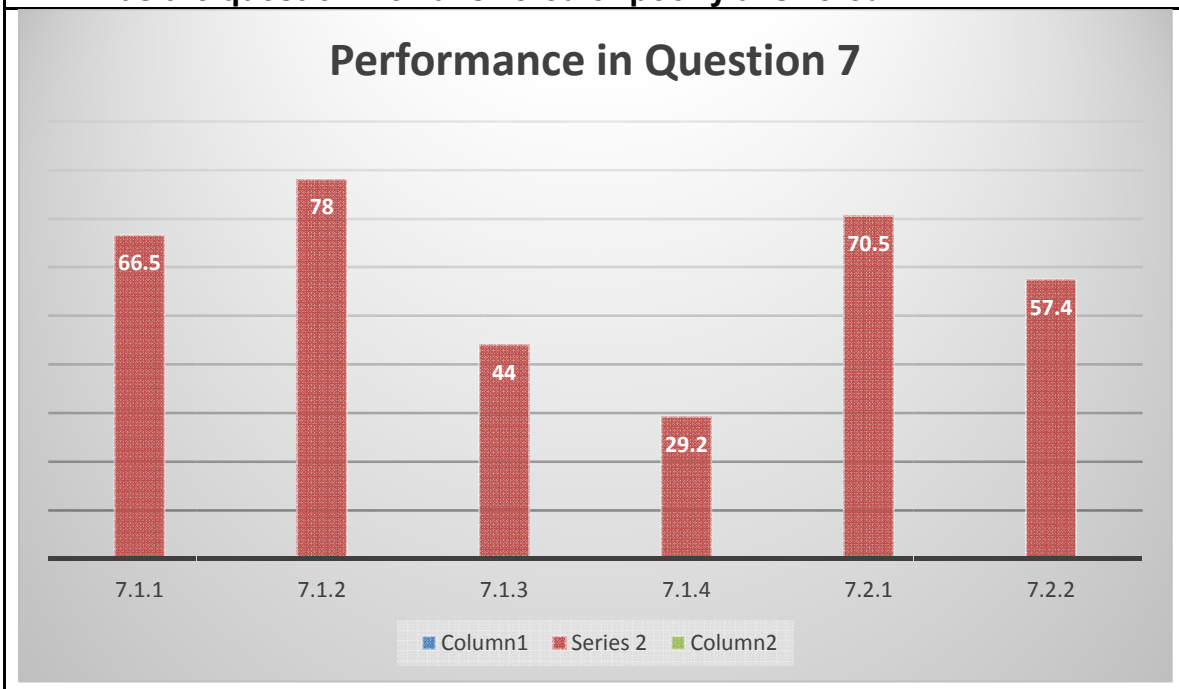
(b) Why was the question poorly answered? Also, provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.

- 6.1.2 was not well answered. The problem here was misunderstanding of the velocity of sound and the velocity of source.
- 6.2 Learners performed poorly in this question. The lack of ability of learners to express themselves well in English Language could be the cause of learner failure in this question.

(c) Provide suggestions for improvement in relation to Teaching and Learning
• Teachers should assist leaners to understand concepts clearly so that they can express these concepts in their own words instead of trying to memorize what the teacher says.
(d) Describe any other specific observations relating to responses of learners
• Stating the Doppler effect formula and interpreting the directions of the velocities of sound and source was done well. They also stated Doppler effect well.
• Equal importance should be placed on the level 1 questions just as any other cognitive level question.

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 answered 50,5% per the rash analysis. The worst question under question 7 was 7.1.4 with 29,2% and 7.1.3 was poorly answered too at 44%. 7.1.1 was better answered at 66,5%.

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

- 7.1.1 A few learners mixed coulomb's law and Newton's universal law together by referring to the mass instead of the charges.
- 7.1.3 Interpreting graphs again posed a challenge to some learners.
- 7.1.4 Learners could not read information from the graph and apply to coulomb's law formula correctly. They read the horizontal axis as r, r^2 instead of inverse of r^2. Learners started with the wrong formula. They wrote the formula for electric field instead of the electrostatic force. They could not interpret relate the gradient

to the KQ_1Q_2. Lack of mathematical knowledge was lacking hence most learners used option 2 in the marking guideline.

- 7.2.1 Lack of basic knowledge in cognitive level 1 type of questions. Learners turn to neglect this type of questions during revision.
- 7.2.2 The use of wrong formula again led to loss of marks in some cases. Learners will write the left-hand side E, but the right-hand side is the formula for kQ_1Q_2.
- Also, identifying the correct directions for the two electric fields resulted in learners losing marks.

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

Teachers should emphasize on graphs. Drawing graphs and interpreting graphs seem to be a challenge year after year. Teaching should cover all cognitive levels.

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

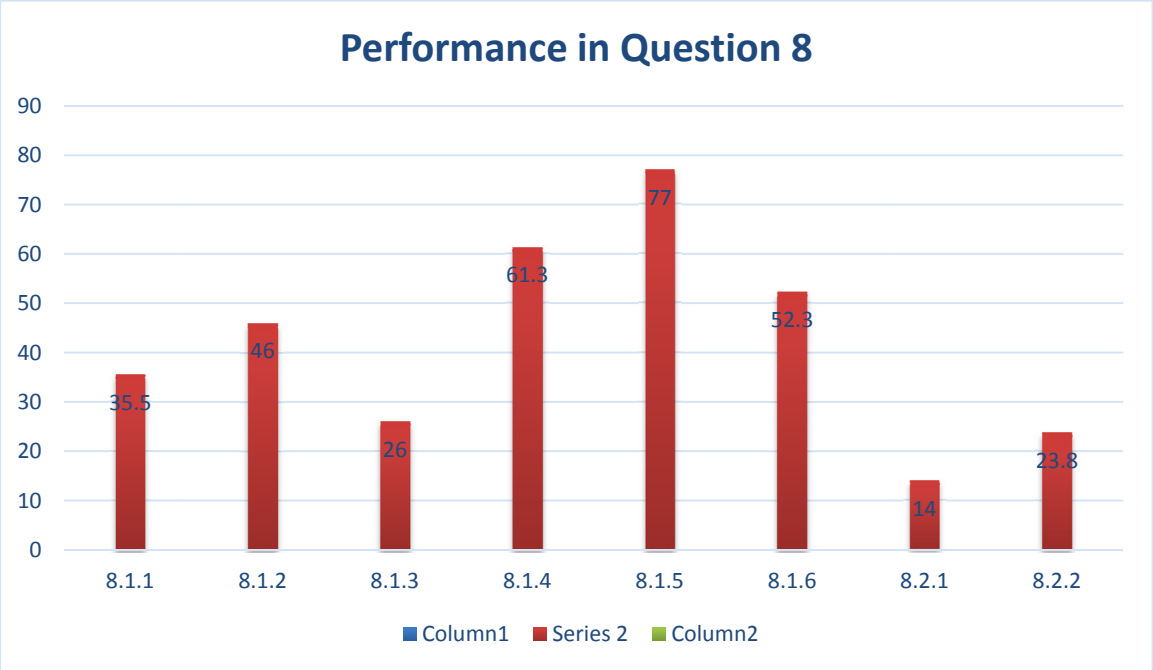
- In 7.2.1 it was observed the most leaners did not know how to draw the electric field pattern around a single point charge. Few learners did not know the dependent variable from the graph.

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

- Teachers should teach from basics and build on to complex level 4 type of questions.

QUESTION 8

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

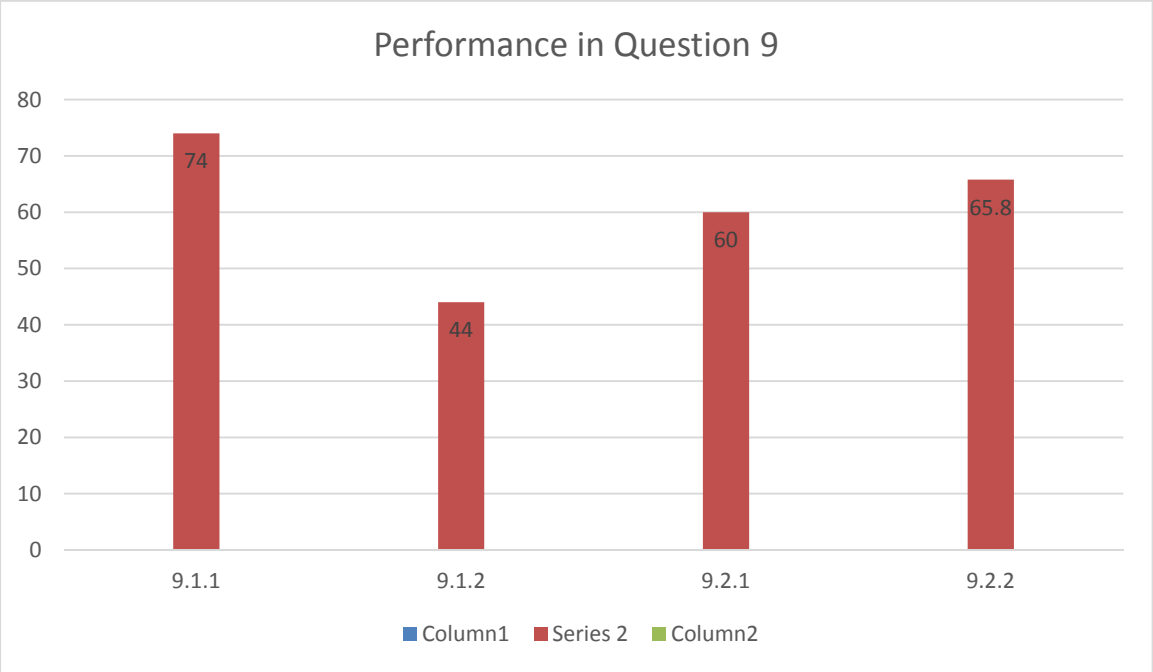


- This question was poorly answered 40,5% per the rash analysis. The worst question under questions 8 was 8.2.1 at 14%. 8.1.3 with 26%, 8.1.1 at 35,5%, 8.1.2 at 46% were poorly answered too at 8.1.5 was well answered at 77%.

(b) Why was the question poorly answered? Also, provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
• 8.1.1, definition of emf. Definitions are not emphasized during teaching and revision. • 8.1.2 and 8.1.3 learners did not consider where the voltmeter is connected. Hence, majority of them were given the value of the potential difference for 8.1.3. They misunderstood the question. Learners were swapping the answers between the two question. 8.1.2 they answered zero and 8.1.3 they answered 12V. Experiment 3 is not conducted at most schools. • 8.2.1 Learners could not calculate the power. Most of them were using the formula P = VI. • 8.2.2 They could not relate the mechanical power to the electrical power. Lack of understanding of concepts. Hence, learners could not calculate the current required to calculate the resistance of T.
(c) Provide suggestions for improvement in relation to Teaching and Learning
• Teach basics. Conduct Experiment 3 on circuits so that learners can observe the reading on the voltmeter at different points in the circuit when the switch is closed or opened • Teach transfer of energy from one form to another with no loss of energy. Especially between mechanical and electrical. So, that learner will understand that any of the formulae for power can be applied in any field. Gravitational or electric field.
(d) Describe any other specific observations relating to responses of learners
Most learners did not have a clue as to how to answer question 8.2.1. Since the question was under electric circuits all they thought of was electrical power.
(e) Any other comments useful to teachers, subject advisors, teacher development etc.
• Teachers should teach for understanding of concepts and application of knowledge to answer specific questions. When concepts are understood, learners will be able to answer any type of question by applying the concepts.

QUESTION 9

(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 61,7% per the rash analysis. 9.1.2 was poorly answered at 44%. The best answered sub question was 9.1.1 at 74%.

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

- 9.1.2 learners who answered 9.1.1 wrongly loss a mark in this question. Another reason is that learners did not follow instruction to draw one cycle. Some had more than one cycle resulting in the loss of a mark. Writing formulae from the date sheet without subscripts also contributed to loss of marks in 9.2.1

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

Teachers should use informal assessments to train learners to adhere to instructions by marking informal assessment strictly. This will train the leaners to get use to following instructions. They should insist on writing the correct formula as it appear on the data sheet.

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

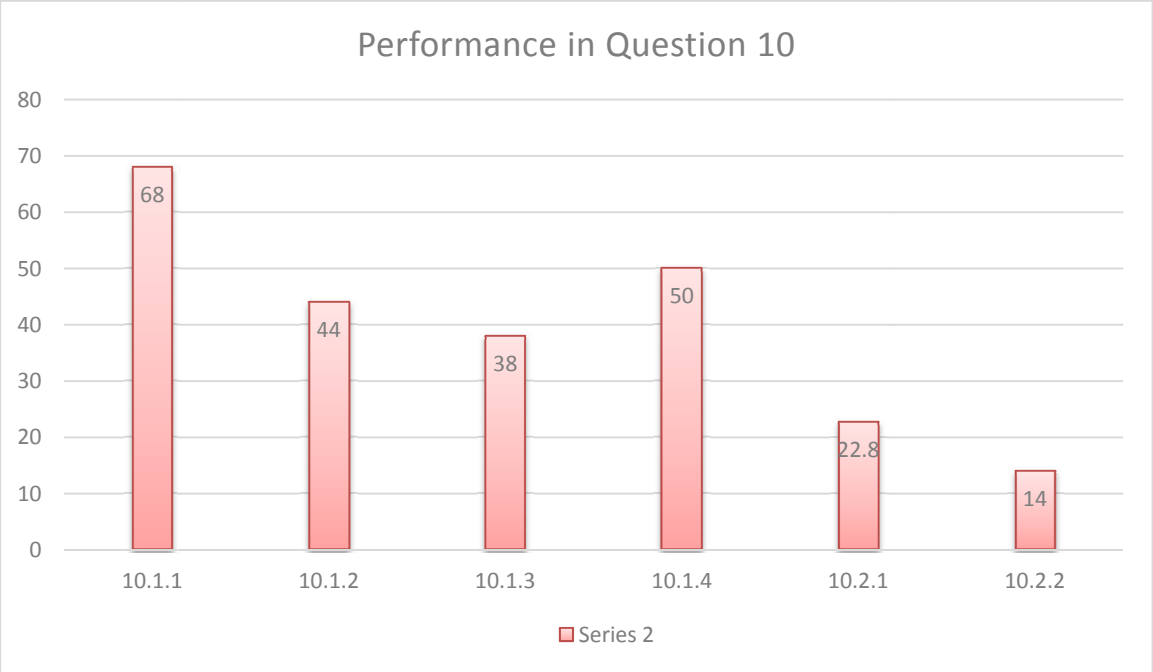
Some learners substituted the $V_{max.}$ for V_{rms}. Learners do not read questions carefully before answering them.

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

Teachers should give many informal but structured assessments such as short test, experiments and mark such assessments strictly so that learners can get enough practice of exam type of questions.

QUESTION 10

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



This question was worst answered question at 37,2% as per the rash analysis. 10.2.1 at 22,8% and 10.2.2 at 14%. However, 10.1.1 was well answered at 68%.

(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 calculate the efficiency. Those could calculate the energy of the photon, failed to calculate the efficiency. Few could calculate the efficiency but also failed to relate the calculate photon energy.
10.2.2 Leaners did not know the relationship between number of photons and number of electron emitted. Hence, they loss the mark for 10.2.2.

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

Teach from basics and emphasize understanding of concepts and relationships between variables.

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

What was observed to be lacking in this question is the ability of learners to relate variables. This also led to loss of marks in 10.1.2 where they must relate the work function to the threshold frequency and 10.1.4 again the fail to relate the kinetic energy to the work function. Less work function more kinetic energy.

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

Teachers should try to use real life scenarios to simplify abstract concepts. Explain the quantization of energy in photoelectric effect clearly to learners.