Province of the
EASTERN CAPE
EDUCATION

EXAMINATIONS AND ASSESSMENT CHIEF DIRECTORATE
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REPUBLIC OF SOUTH AFRICA, Website: www.ecdoe.gov.za

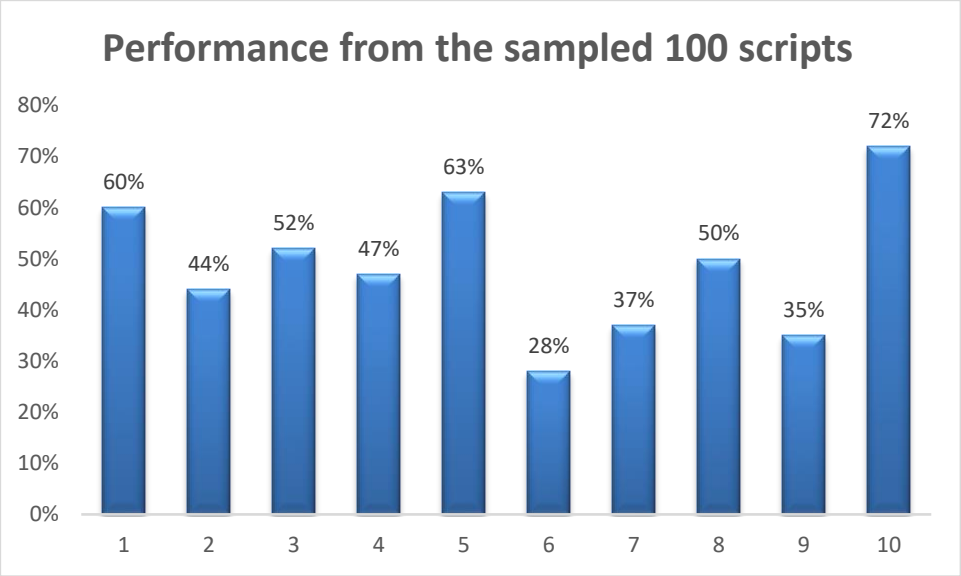
2023 NSC CHIEF MARKER'S REPORT

SUBJECT	**TECHNICAL SCIENCES**		
QUESTION PAPER	1x	2	3
DURATION OF QUESTION PAPER	**3 Hours**		
PROVINCE	**Eastern Cape**		
DATES OF MARKING	**4 – 19 December 2023**		

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

The table below and the graph give a general overview of the performance of the candidates based on the sampled scripts. The lowest and poorly performed question is question 6, under the topic Waves Sound and Light which was at 28%. The other poorly performed questions (**highlighted in the table**) are questions 2,4,7 and 9 which were all below 50%. The overall average percent is 50% an improvement of 9% from 2022 performance of 41%.

Question	Topic	Ave. performance %
1	MCQ- All Topics	60%
2	Mechanics - Newton's 2nd Law	44%
3	Mechanics - Momentum and impulse	52%
4	Mechanics - Work Energy and Power	47%
5	Mechanics - Elasticity, Viscosity and Hydraulics	63%
6	Waves Sound and Light- Reflection and Refraction	28%
7	Waves Sound and Light - Electromagnetic radiation and Lenses	37%
8	Electricity and Magnetism - Capacitors	50%
9	Electricity and Magnetism - Electric circuits	35%
10	Electricity and Magnetism- Generators and Transformer	72%
Total		**50%**



SECTION 2: Comment on candidates' performance in individual questions

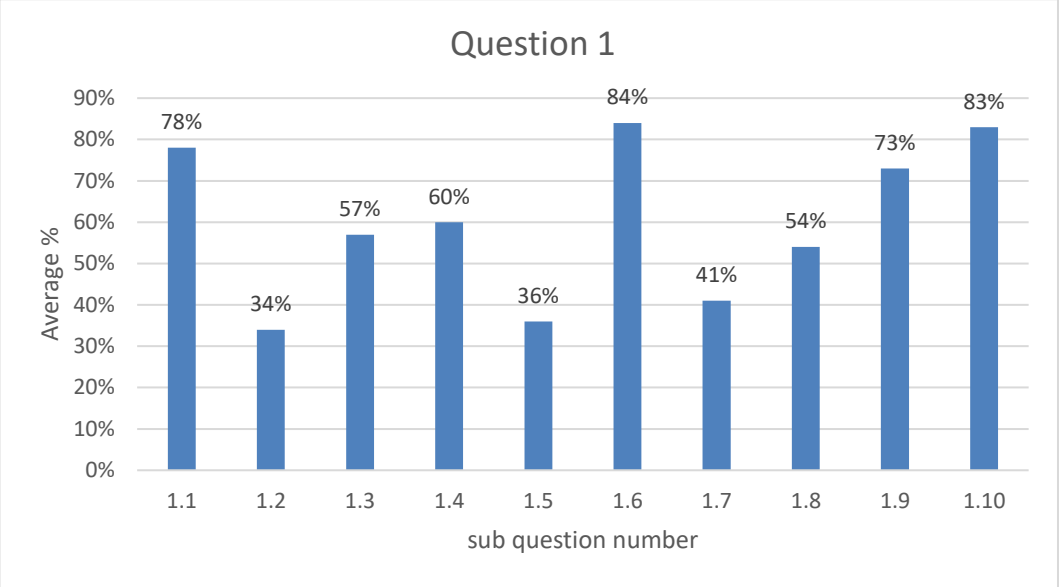
QUESTION 1 - (60%)

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

Question 1 is based on multiple choice questions covering all the topics. The performance in this question was fairly well at 60%. The most poorly answered questions were; 1.2, 1.5 and 1.7. Below is the table and graphical representation of the results in this question.

Sub-question	Topic	Ave. performance %
1.1	Newton's 3rd law	78%
1.2	Newton's 2nd law	34%
1.3	Momentum and impulse	57%
1.4	Work, Energy	60%
1.5	Hydraulics- fluid pressure	36%
1.6	Elasticity	84%
1.7	Refraction of light	41%
1.8	Electromagnetic radiation	54%
1.9	Electrostatics- capacitors and capacitance	73%

1.10	Electromagnetism- transformer	83%



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

The topics in which the performance was poor are as follows:

Newton's second law of motion, (1.2) most candidates gave option "D". This is an indication that candidates did not know that the gradient of the graph is not independent of the mass. Also, candidates seem not to know the relationships of the variables between net force, mass and acceleration. This error could be attributed to the error which is in the CAPS document that does not state the relationships in the definition of Newton's second law of motion.

In question 1.5, the common answer that was given was option "B". This implies that density and mass of the liquid determines the fluid pressure at a given depth. This could be a misconception.

In question 1.7 candidates got random wrong answers meaning that they could have been guessing.

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

Teachers must teach thoroughly all the topics and discourage learners from guessing multiple choice questions. Teachers must teach learners skills of how to answer multiple choice questions.

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

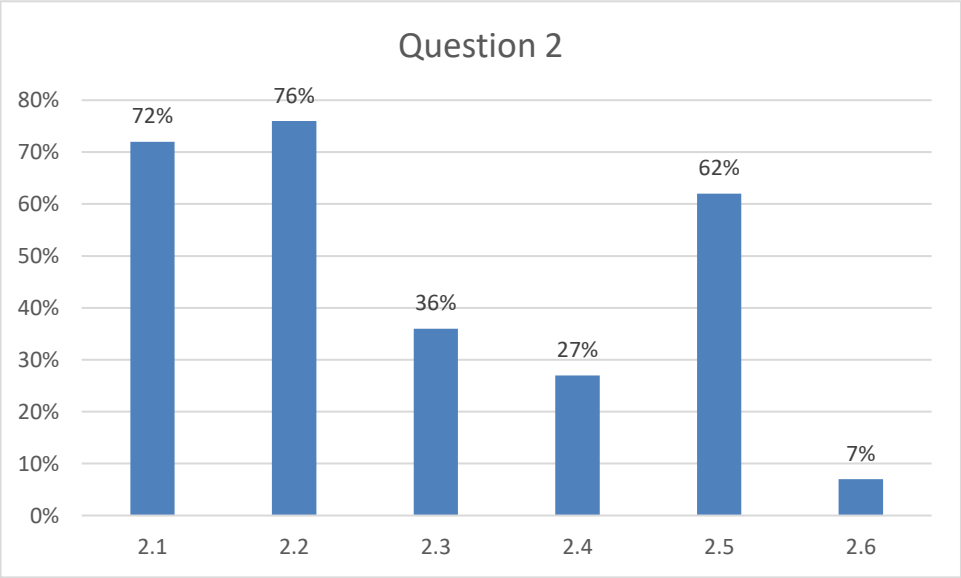
Most multiple-choice questions are low order questions; therefore, curriculum specialists and teacher development can develop material to cover such type of questions so that learners can revise and practice on how to answer questions.

QUESTION 2- (44%)

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

Question 2 was poorly answered with an average of 44%. The most poorly answered sub question was 2.6 at 7% followed by 2.4 at 27% and 2.3 at 36% respectively. The table and graph below show the performance in each sub question and topic thereof.

Sub-question	Topic	Ave. performance %
2.1	Free body diagram	72%
2.2	Newton's 2nd law	76%
2.3	Tension	36%
2.4	Coefficient of kinetic friction	27%
2.5	Frictional force	62%
2.6	Frictional force	7%



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

Candidates could have done better in 2.1 but were making errors on the labeling of the forces on the free body diagram. In 2.6 Candidates did not understand that the normal force is directly proportional to frictional force despite a high percentage correctly answering in 2.5

that the magnitude of frictional force will increase, its probable that most candidates guessed the answer in 2.5. In 2.4 candidates could not calculate the coefficient of frictional force mainly because of multistep calculation involved to get to the answer. Most candidates did not know that they had to calculate frictional force first and then calculate the coefficient of frictional force using the formula $f_k = \mu_k N$. In 2.3 candidates could not resolve the tension by using **cosθ**.

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

Teachers must emphasize the importance of correctly labelling the forces on the free body diagram and differentiate between capital letters and small letters. Teachers must assess learners using questions involving resolving forces acting at an angle and also teach learners how to calculate problems in a multistep approach. The concepts of the relationship between frictional force and normal force must be thoroughly covered in grade 11 and revise in grade 12.

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

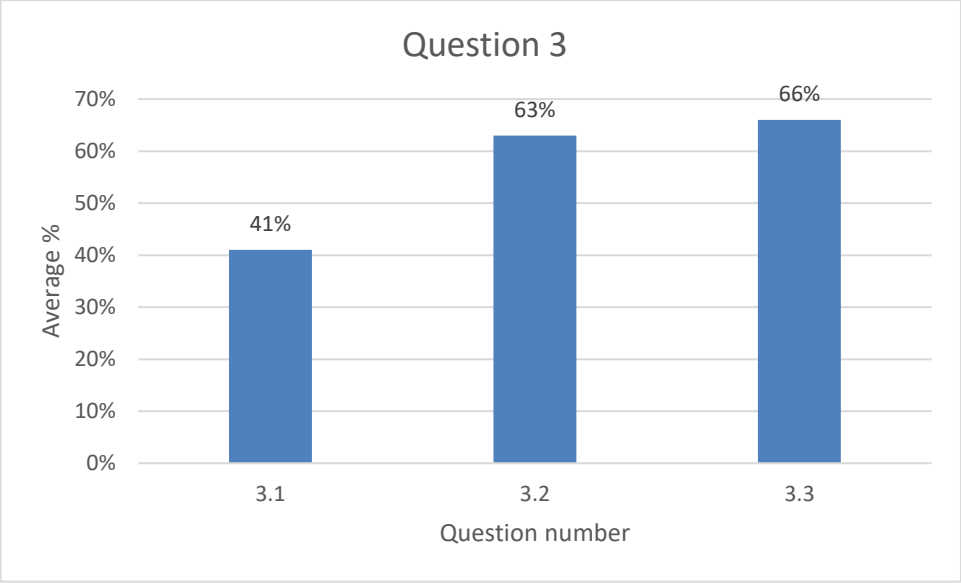
The use of the data sheet and using correct formulae is very important. If a candidate chooses a correct formular and substitute in the formula, they are guaranteed a mark for the correct formular. The labels on the free body diagram must have correct subscripts and forces must completely touch the dot and the arrow head. Subject specialists and teacher development must organize content training on this topic to address issues identified.

QUESTION 3- (52%)

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

The question performed fairly at 52%. The least performed question was 3.1 at 41%, where candidates were asked to state the principle of conservation of linear momentum. Candidates also struggled to calculate average speed and total momentum of the trolleys. The table and the graph below show the overall performance of the candidates in this question.

Sub-question	Topic	Ave. performance %
3.1	Momentum and impulse	41%
3.2	Momentum and impulse	63%
3.3	Momentum and impulse	66%



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

In 3.1 Most candidates could not state the principle of conservation of linear momentum correctly. They left out key words such as linear and isolated system, and could not calculate the average speeds of the trolleys.

In 3.2 some candidates could not define Impulse and calculate the net force. Candidates were confusing between momentum and impulse and used wrong formular to calculate the net force. Some candidates did not convert 600g to kilograms hence got a wrong answer.

In 3.3 candidates were confusing between safety features of the car and generally what would reduce injuries during collisions.

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

Teachers must provide examination guidelines to learners and must mediate through with them. Teachers must emphasize the importance of writing of definitions, laws and stating concepts without leaving out key words as they appear in the examination guidelines.

Teachers must place emphasis on using correct conversions in calculations and must revise motion in one dimension in grade 11.

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

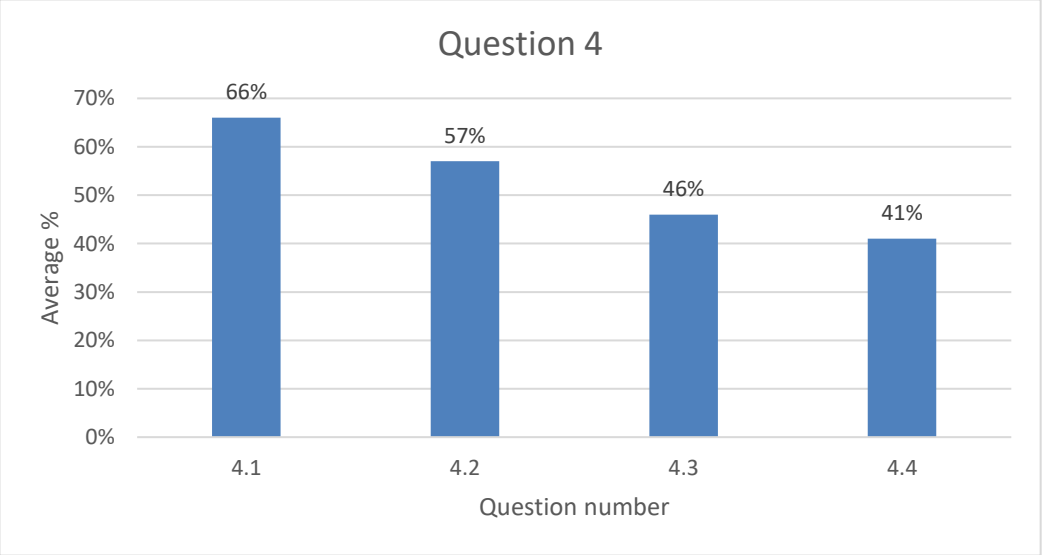
Some candidates were confusing between conservation of linear momentum and conservation of mechanical energy; therefore, it is imperative to encourage learners to use the examination guidelines when they are studying. Curriculum advisors and teacher development should supply hardcopies of examination guidelines to learners and teachers who are in schools that cannot afford to print the document.

QUESTION 4 - (47%)

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

The question performed poorly at 47%. They answered poorly in defining work, calculation of work done and stating the principle of conservation of mechanical energy. Questions 4.3 and 4.4 were the most poorly answered. The table and the graph below show the overall performance of the candidates in this question.

Sub-question	Topic	Ave. performance %
4.1	Define work	66%
4.2	Calculate work done	57%
4.3	Calculate average power	46%
4.4	Conservation of mechanical energy	41%



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

Candidates could not give correct definition of work. They left key words such as product and applied force. In 4.2 some candidates used wrong formula. In 4.3 they used an incomplete formular for calculating average power. Some candidates could not convert the watt to horsepower and gave wrong or no units. In 4.4 candidates left out key words '**total**' or '**sum**' in the definition of principle of conservation of mechanical energy.

Candidates used an incomplete formula to calculate the velocity using the principle of conservation of mechanical energy, they omitted subscripts to differentiate the mechanical energy at the top and at the bottom.

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

Examination guidelines must always be used in the teaching and learning for learners to

master the definitions. Learners must be encouraged to use the data sheets to get the correct formulae. When comparing the mechanical energy at different points, subscripts must be correct, that is; Top and Bottom or whatever the points are.

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

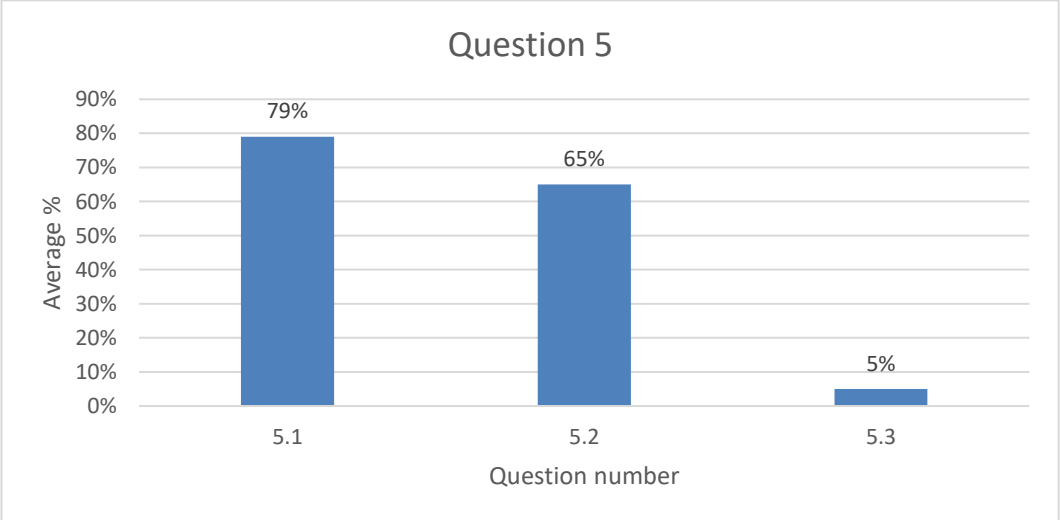
Teachers must explain on how to use the formula $M_E = E_k + E_p$ and apply it in calculations involving principle of conservation of mechanical energy. Some candidates were calculating separately the mechanical energy at A and B then equating the two. This method can be used too. Most candidates have a misconception between gravitational potential energy and potential energy, they use the concepts interchangeably.

QUESTION 5 – (63%)

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

The performance of candidates in this question was generally fair. Candidates performed poorly in sub question 5.3 at 5%. The table and the graph below show the overall performance of the candidates in this question.

Sub-question	Topic	Ave. performance %
5.1	Hydraulics- fluid pressure	79%
5.2	Stress and Strain	65%
5.3	Viscosity	5%



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

Candidates did not understand what the question was asking in 5.1.2. The question was asking if the calculated output force in 5.1.1 is sufficient to press the work piece flat, but many

candidates were comparing the input force to the output force. Candidates left out the key words 'internal' or 'restoring' in the definition of stress. Candidates were swapping formulae from sub question 5.2.2 – 5.2.4. Learners were losing marks due to rounding off. Some candidates did not know how to calculate the area. Wrong units were used in the final answers. In 5.3 Very few candidates got the answer correct it seems the topic viscosity was not adequately covered.

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

Teachers need to spend time on this topic to address definitions, multistep calculations, units and the use of data sheets for formulae. Previous past question papers will be ideal to use in the teaching of this topic. Learners need to know which formula to use for specific questions.

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

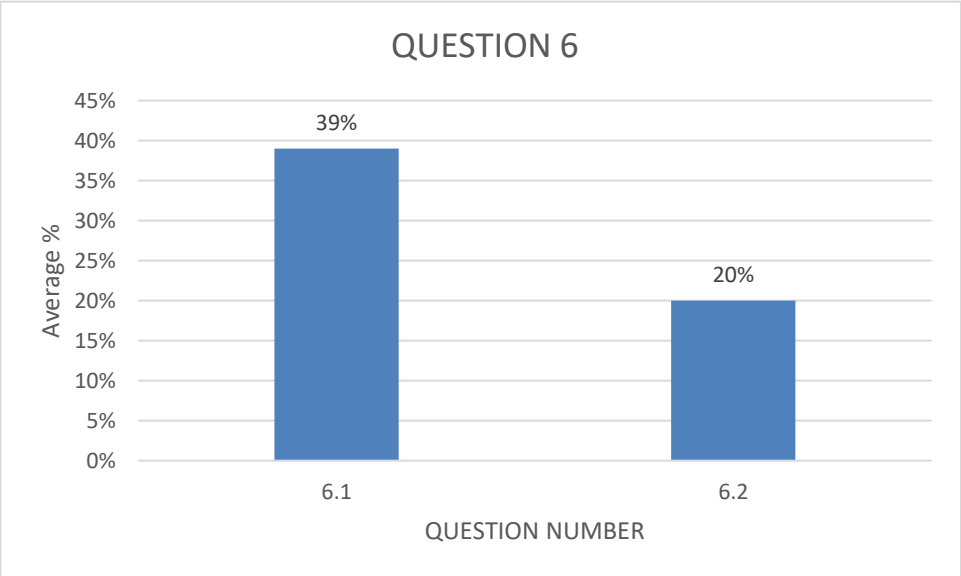
The standard rounding off is two decimal places unless specified. Learners must not use the scientific notation mode on the calculators because answers will always be out of the range.

QUESTION 6 – (28%)

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

This is the poorest performed question at 28%. Candidates seemed to have very little knowledge in this topic. Both sub questions were below 40%. The table and the graph below show the overall performance of the candidates in this question.

Sub-question	Topic	Ave. performance %
6.1	Reflection of Light	39%
6.2	Refraction of light - Total internal reflection	20%



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

Candidates showed lack of scientific knowledge in this question. Many candidates left out the question blank in some sub questions. In 6.1, candidates could not describe reflection. They did not understand the law of reflection either as they were unable to state the relationship between angles θ_1 and θ_2. Candidates could not state the properties of an image in the mirror. In 6.2 candidates could not describe what happens to the ray of light during refraction. Many candidates did not understand critical angle. Candidates were unable to draw the ray of light from water to air and label the rays.

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

Teachers need to teach this topic thoroughly, starting from learners' previous knowledge. Use examination guidelines for definitions and concepts. Discuss properties of images formed in the mirror. Learners must be allowed to draw ray diagrams and label them.

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

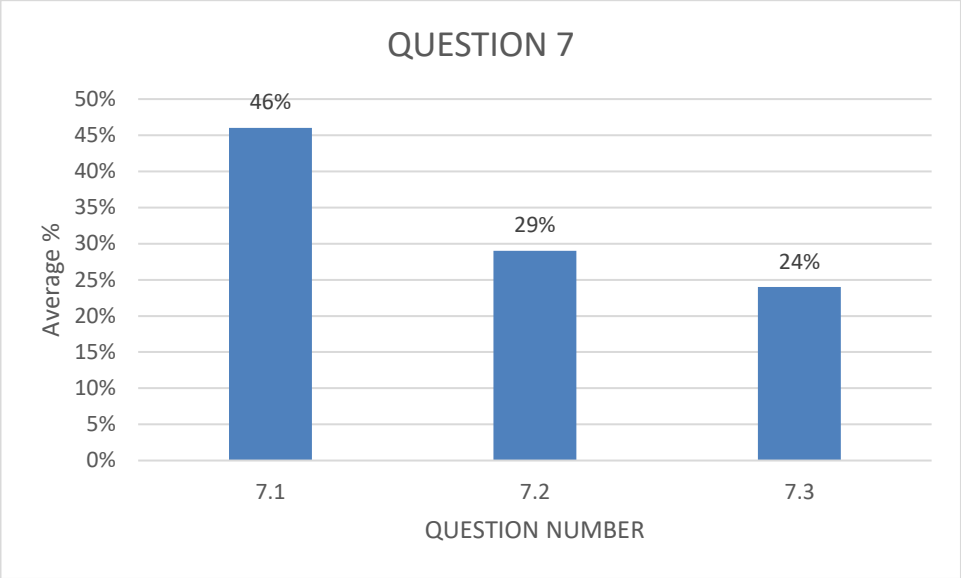
The poor performance in this question indicates that candidates have little or no knowledge in the topic. Therefore, teacher development and curriculum specialists need to plan for a content training workshop for teachers.

QUESTION 7- (37%)

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

The performance for this question was at 37%. This question is the third poorly performed question in this question paper. All the sub questions were poorly answered. The table and the graph below show the overall performance of the candidates in this question.

Sub-question	Topic	Ave. performance %
7.1	Electromagnetic radiation	46%
7.2	Lenses	29%
7.3	Application of Lenses	24%



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

Candidates could not identify the type of radiation asked. Those who identified could not write the correct spelling. Candidates did not correctly calculate the energy of the photon. They got the correct formula and substituted correctly but got the wrong final answer. Candidates could not explain how a virtual image is identified or located on a ray diagram. Candidates could not identify the type of lenses in 7.2.2, those who identified the lens were giving a wrong spelling as converse instead of convex.

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

Teachers must teach thoroughly the topic Waves Sound and Light, as it can be seen from the performance from question 6 and 7. Learners seem not to have adequate knowledge in the topic. Teachers must teach learners on how to correctly use the scientific calculator.

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

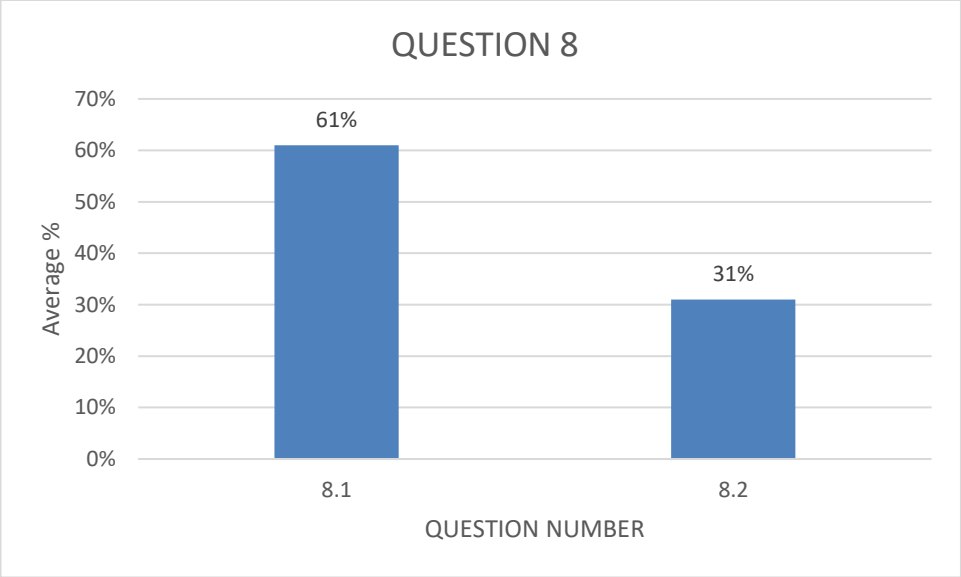
The poor performance in this question indicates that candidates have little or no knowledge in the topic. Therefore, teacher development and curriculum specialists need to plan for a content training workshop for teachers.

QUESTION 8- (50%)

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

This question performed fairly at 50%. Question 8.2 was poorly performed at 31% making the overall performance low. The table and the graph below show the overall performance of the candidates in this question.

Sub-question	Topic	Ave. performance %
8.1	Electrostatics- capacitors and capacitance	61%
8.2	Electrostatics- capacitors	31%



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

Candidates were choosing the correct formula for capacitance but were wrongly substituting in the formular the distance for capacitance hence losing marks in 8.1. Some candidates were changing the subject of the formular before substitutions and ended up with a wrong subject of the formular. In question 8.2 most candidates misunderstood the question and they were mentioning the devices that have capacitors and not necessarily the use of capacitors in technology.

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

Teachers must revise conversion of units before introducing calculations in the topic. Teachers must start with simple calculations to ensure thorough understanding. Thorough revision must be done with learners where learners will be required to practice multistep calculations. Applications of capacitors in technology must be given as a research assignment so that learners can gather information before it is discussed with the teacher in class.

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

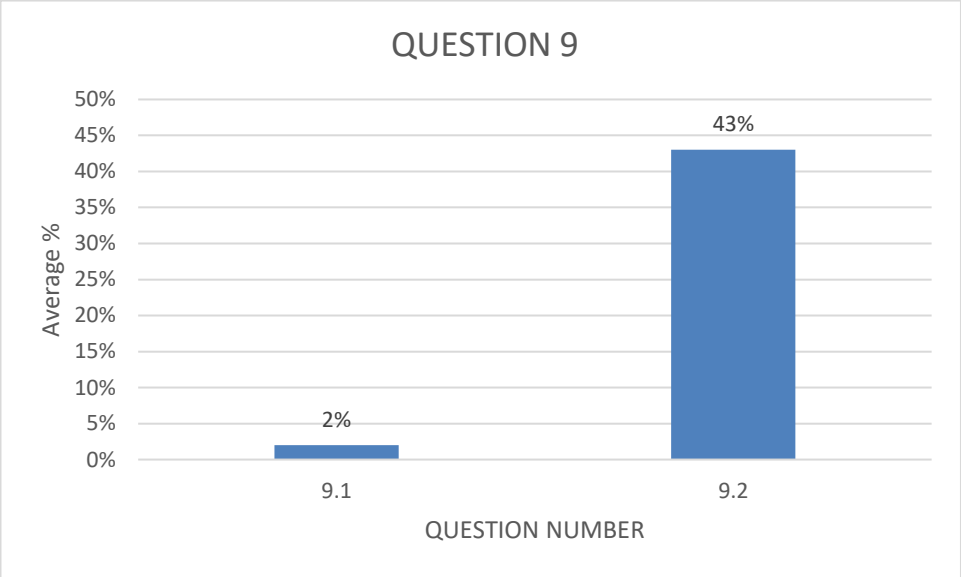
Some of the correct responses from learners on this question were beyond the scope of this topic, therefore curriculum specialist and teachers must ensure that they advise learners what is needed for examination purposes.

QUESTION 9- (35%)

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

The performance of candidates in this question was at 35%. It was the second poorly performed question in the paper. The table and the graph below show the overall performance of the candidates in this question.

Sub-question	Topic	Ave. performance %
9.1	Electric circuits- Power	2%
9.2	Electric circuits- Electrical energy	43%



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

In question 9.1 candidates failed to explain the meaning of the power rating on the welding machine. The performance for this sub question was at 2% meaning that candidates did not understand the meaning. In 9.2 some candidates used the voltage of 200V even though it was stated that the voltage had changed. Calculation of the cost of electricity proved to be a challenge to a lot of candidates.

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

Teachers must spend adequate time on this topic explaining all the concepts. Teachers must encourage learners to carefully read the questions before answering. The formula of calculating the cost of electricity is not part of the data sheets, therefore, teachers need to make the learners aware.

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

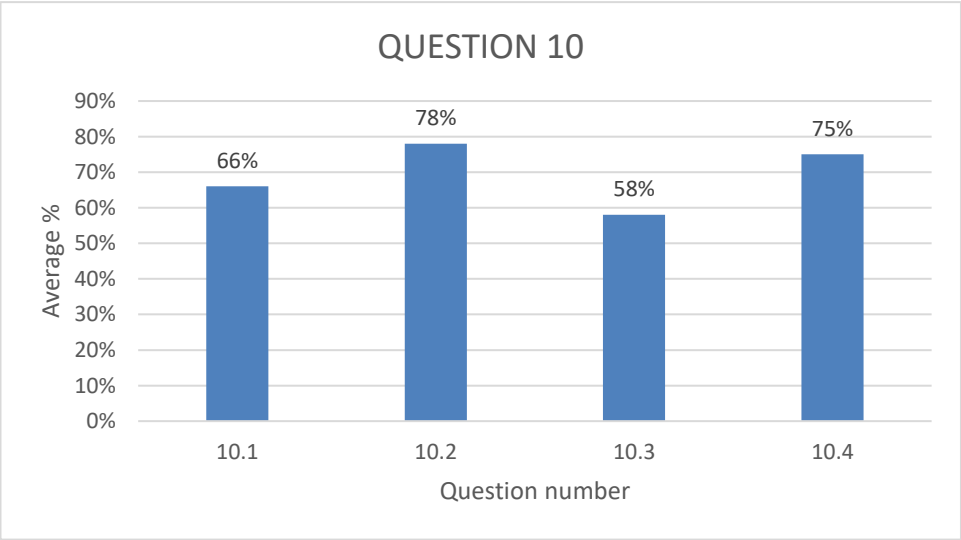
The performance in the question indicates that the topic was not well taught. Teachers must give special attention to the topic. Teachers must teach all the prescribed content, not only the content that had been assessed in the previous years.

QUESTION 10 – (72%)

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

Question 10 was the best performed question at 72%. Generally, all the sub questions performed above 50%. The least performed was at 58%. The table and the graph below show the overall performance of the candidates in this question.

Sub-question	Topic	Ave. performance %
10.1	Electromagnetism- generator	66%
10.2	Electromagnetism- generator	78%
10.3	Electromagnetism- generator	58%
10.4	Electromagnetism- transformer	75%



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

Some candidates failed to define the term generator, and state why the generator in the diagram was an AC generator. A few candidates could not explain what a step-up

transformer is. Some candidates also failed to calculate the voltage in the secondary coil. Candidates used the correct formular but substituted wrongly.

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

Attention must be given to the use of correct formulae and correct substitutions when teaching this topic. All definitions must be thoroughly taught as per 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.

Material development for such topics can be of value for learners and teachers to understand the concepts. Teacher development and curriculum specialists can embark on such a venture.