Province of the
EASTERN CAPE
EDUCATION

EXAMINATIONS AND ASSESSMENT CHIEF DIRECTORATE
Home of Examinations and Assessment, Zone 6, Zwelitsha, 5600
REPUBLIC OF SOUTH AFRICA, Website: www.ecdoe.gov.za

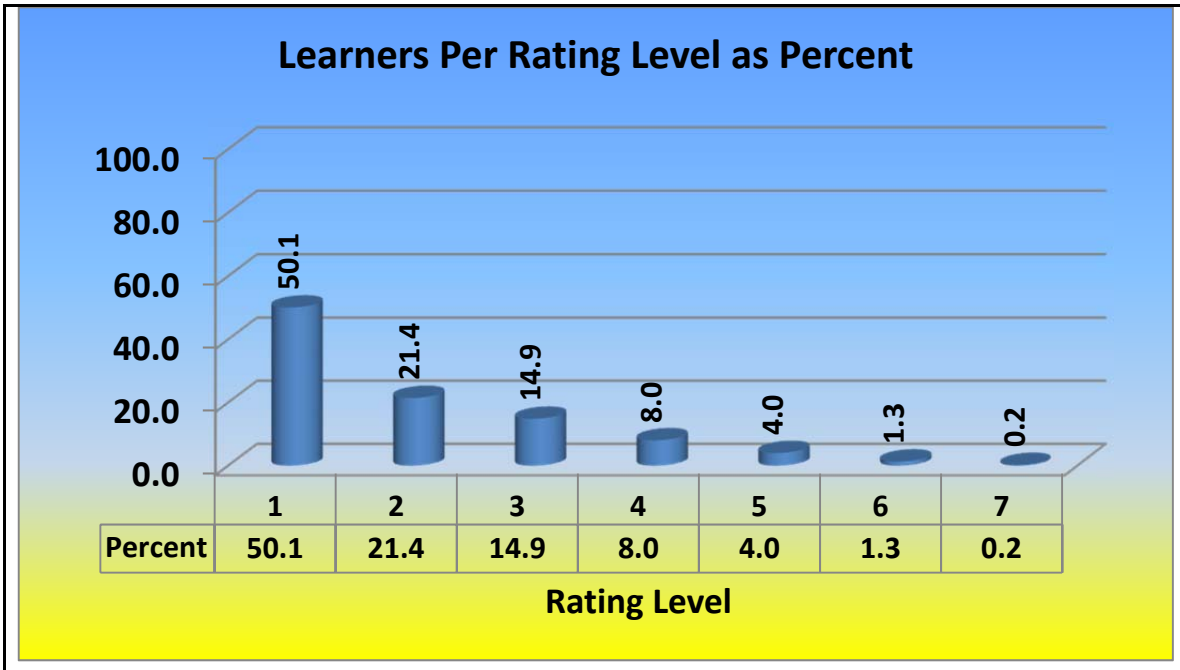
2019 NSC CHIEF MARKER'S REPORT

SUBJECT:	**TECHNICAL SCIENCES**
PAPER:	**1**
DURATION OF PAPER:	**3 HOURS**
DATES OF MARKING:	**30 NOVEMBER TO 14 DECEMBER 2019**

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

Learners performed fairly well even though there is a very small improvement from the class of 2018 which was at a pass percentage of 49,2%. This year the performance is at 49,9 that is 0,7% improvement which is not satisfactory, there is an improvement in the level rating. The level 1 are at 50,1% which is just below by 0,7% from the previous year, with level 2 at 21,4% which increased gradually from 2018 which they were at 20,3%, level 3 learners at a low of 14,9% then level 4 learners at 8.0% which is an improvement from the previous year, basically there is improvement in all the levels as indicated in the graph but the number of level 7 learners decreases this year at 0,2% while last year it was at 0.8.

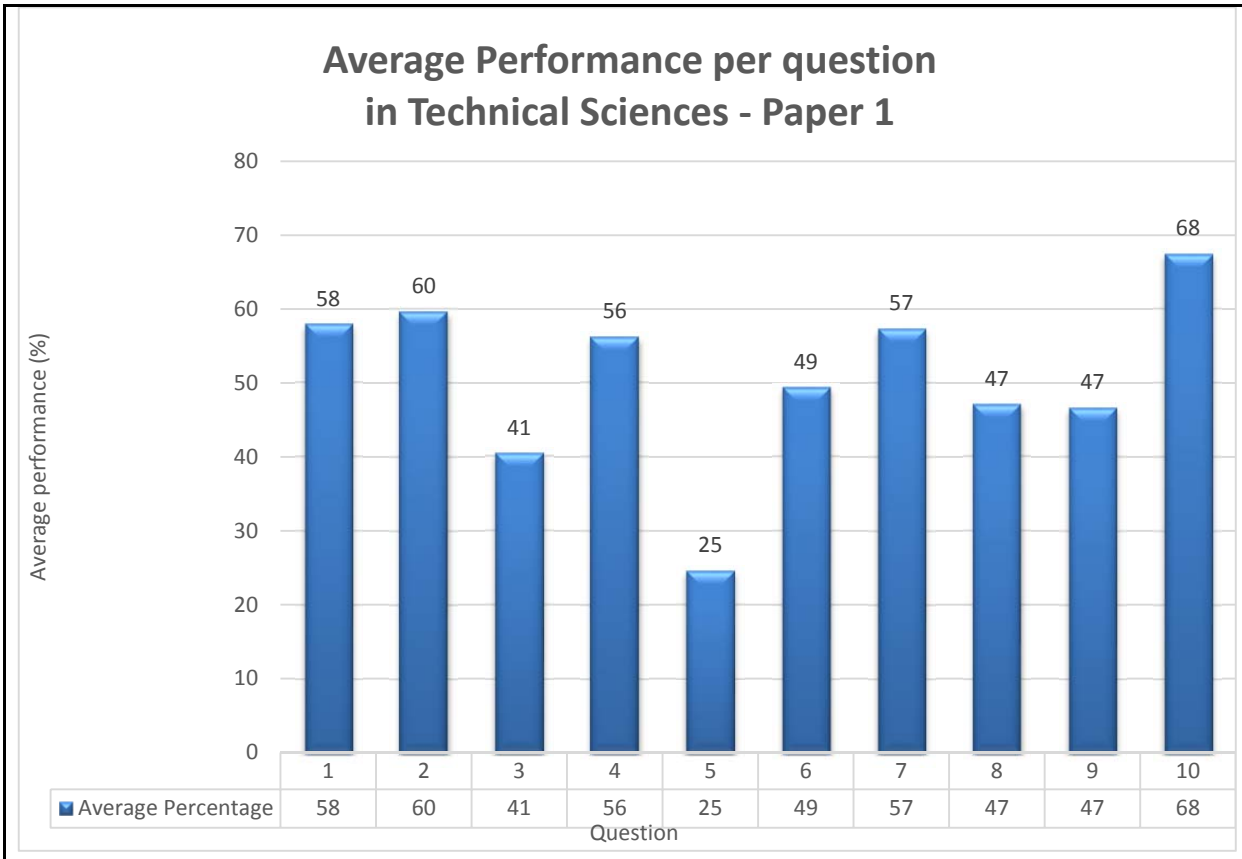
LEVEL	NUMBER	PERCENTAGE
1	836	50.1
2	358	21,4
3	248	14,9
4	134	8,0
5	67	4,0
6	22	1,3
7	4	0,2
TOTAL	1669	100



The paper was fair with all questions being scaffolded in terms of level of difficulty. Learners attempted all questions in the paper and there are indications that candidates finished writing the paper within stipulated time.

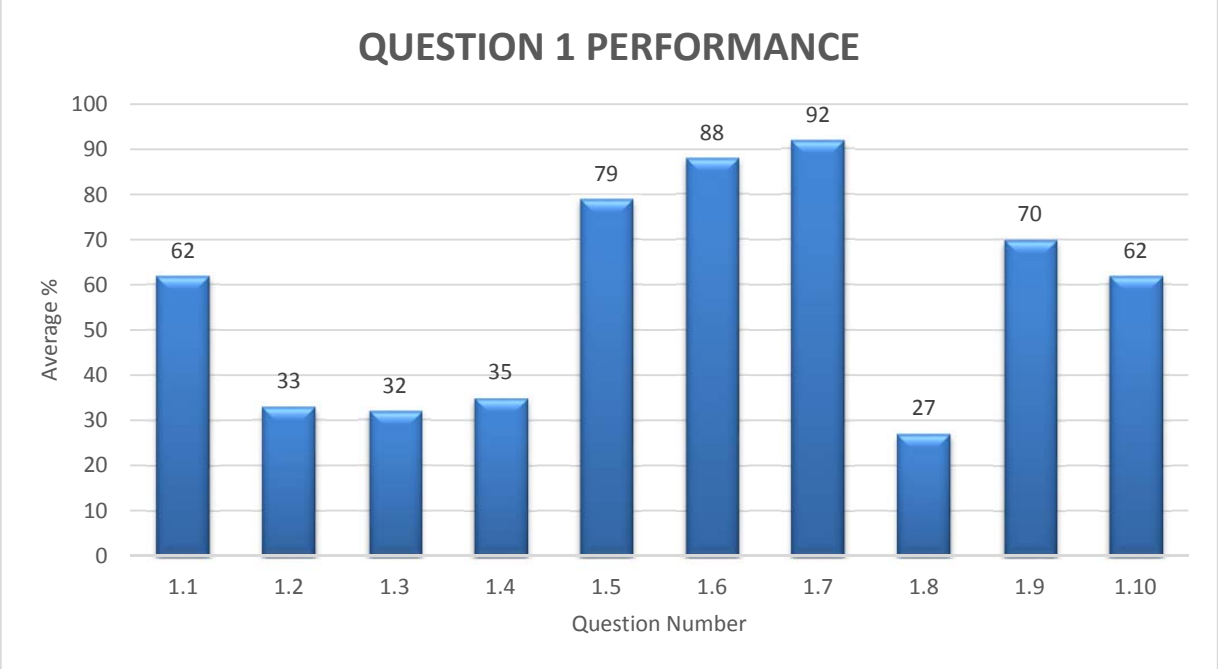
After analysing performance of learners from the 100 sampled scripts, one may say that learners performed fairly well in the paper. Performance of the learners in the province is generally fair with an overall performance of 51.5% pass rate. This performance shows an improvement of 2.3% from 2018 class's performance.

The graph below shows an overall performance of learners per question. Studying the graph, one would notice that there are questions that proved to be challenging to learners as they are performed poorly. Those are questions such as 3 and 5, with question 5 being the worst performed question in the paper with an average percentage of only 25%. There were also questions where learners managed to score good marks, e.g. question 10 with an average performance of 68%.


Average Performance per question in Technical Sciences - Paper 1
Average performance (%)
80
70
60
50
40
30
20
10
0
58
60
41
56
25
49
57
47
47
68
1 2 3 4 5 6 7 8 9 10
Average Percentage 58 60 41 56 25 49 57 47 47 68
Question

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: Various concepts - {58 %}
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
This is a Multiple-Choice Question which addressed various concepts in the subject. Learners performed fairly on this question. Learners did well in 1.7, 1.6 and 1.5.


(b) Why the question was poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
Learners were unable to find correct answers on various sub-questions. Those include 1.2, 1.3, 1.4 and 1.8. These questions wanted them to either apply knowledge to get to the correct answer or simple recall as was required in 1.8. There are indications that learners don't have a clear strategy to deal with Multiple-choice questions. Most of the candidates counted on guess work which did not assist them.

(c) Provide suggestions for improvement in relation to Teaching and Learning
As answering this question demands that leaners display maximal knowledge of content, teachers need to teach basic concepts thoroughly. Teaching should also focus on establishing relationships between various quantities and learners must learn to explain these relationships expressing them in words and mathematically. Learners must all definitions and must be able to apply knowledge in explaining various aspects in various topics.

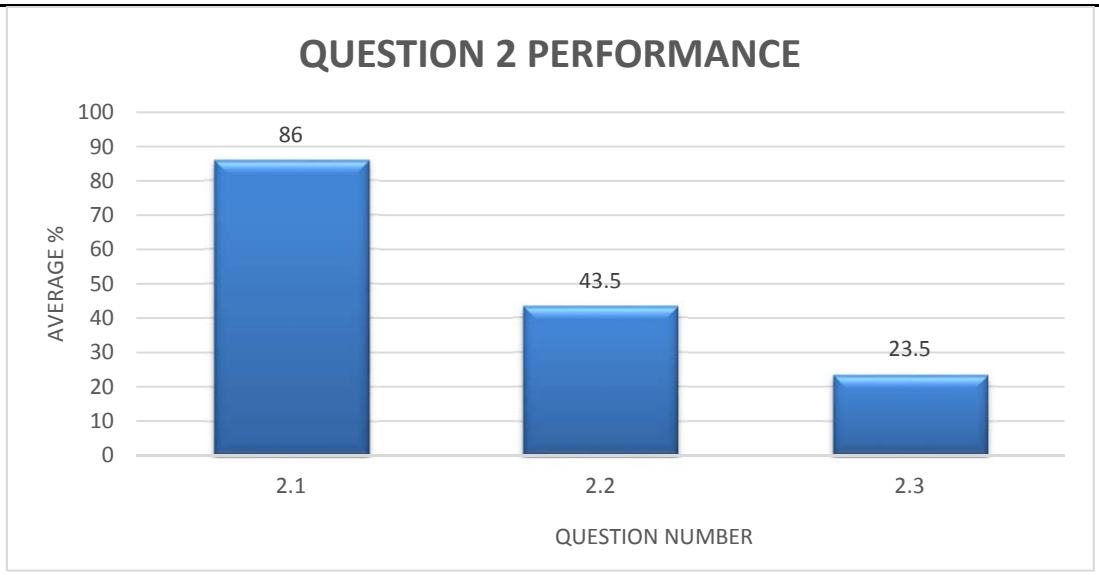
(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
Learners must be trained to work out answers in the Multiple-Choice questions other than relying on guess work. Educators must train learners on interpretation of various equations and explaining

relationships between terms.

QUESTION 2: Newton's First law - {60 %}

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

Learners performed fairly well in this question at an average percentage of 60%. Performance improved on drawing free-body diagram as learners performed best with an average percentage of 86%. Performance in 2.2 was bad and worse in 2.3 with average percentages of 43.5% and 23.5% respectively.



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

Learners could not state Newton's first law of motion as they mostly could not relate the given situation with the law. Those who could identify that Newton's first law was involved could not give statement of the law, as it was required in 2.2, and most of them were omitting key words in the law and they lost marks. There was a considerable number of candidates who misunderstood the question as they just named the law without stating it.

The greater majority of candidates could not use the law to explain a situation as they were required to do in 2.3 but rather gave the statement of the law. This required that candidates display understanding and show ability to apply the law, and candidates failed to do that hence they performed at an average percentage of 23.5%.

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

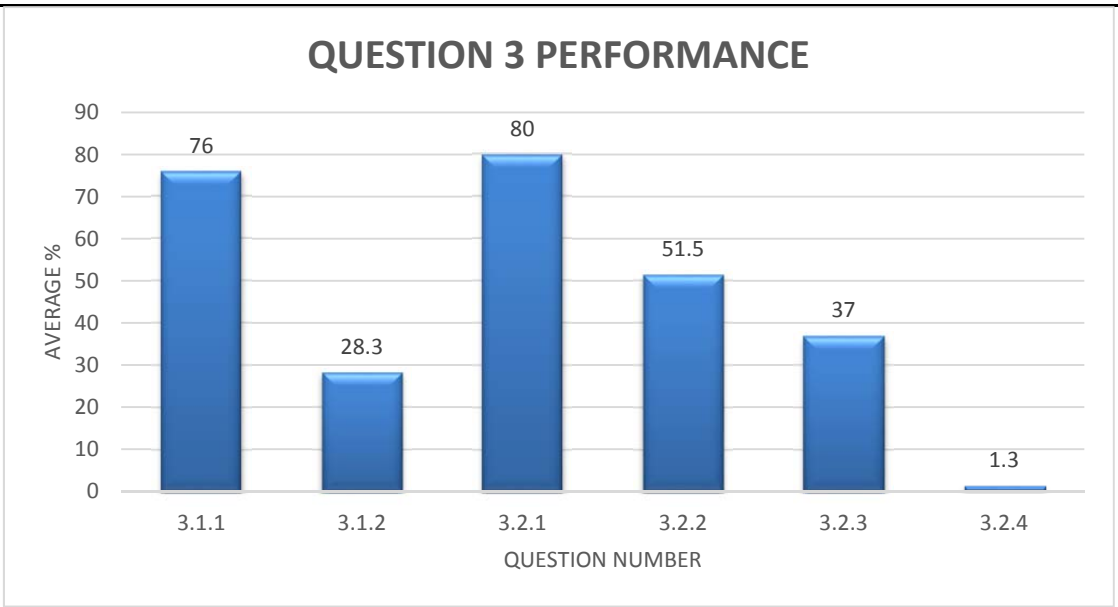
Drawing of free-body diagram must be taught thoroughly and learners must be given key aspects to note when answering questions. Learners must be made aware that a free-body diagram is incomplete without arrows and labels going together. Teachers must intensively teach applications of Newton's laws and also train learners such that they be able to identify situations in which laws are applicable. Learners must be also trained to use scientific reasoning to account for occurrences in nature and in situations outside the classrooms. Educators must expose learners to various contexts in which Newton's laws are applied.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
Learners showed inability to analyze questions and respond accordingly. Emphasis must be put on the aspect of reading questions for understanding such that learners are able to respond to questions properly. Key words that are used for questioning in the subject must explained to learners such that they think that naming and stating the law have one meaning.

QUESTION 3: Newton's second and third laws - {41 %}

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

Learners performed poorly in this question. Performance was worse in questions 3.1.2 and 3.2.4 with 28.3% and 1.3% respectively. These two sub-questions dropped the average of the question to an average percentage of 41%.



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

Learners performed better in questions 3.1.2 (76%) and 3.2.1 (80%) where they were required to state Newton's third and second laws of motion respectively. Learners performed poorly in question 3.1.2 which required them to calculate a force exerted by crate **B** on crate **A.** This question required demonstration learners' abilities to integrate Newton's second and Newton's third law in answering the question. Learners were unable to apply both laws in answering the question and they lost marks. Learners did not work with a free-body diagram which would assist them identify forces acting on each crate. Many candidates did not even get the formula mark.

Question 3.2 also required effective use of free-body diagram which learners failed to realize. This resulted in learners not being able to answer 3.2.2 properly. Learners had to explain their choice in 3.2.3 in answering 3.2.4. This they failed to do and lost marks. Learners were unable to explain why the frictional force will decrease when the force that was acting horizontally was changed to act at an angle. They failed to reason out the relationship between the normal force and frictional when there is an introduction of a vertical force. Question 3.2.3 was also poorly answered at an average of 37%.

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

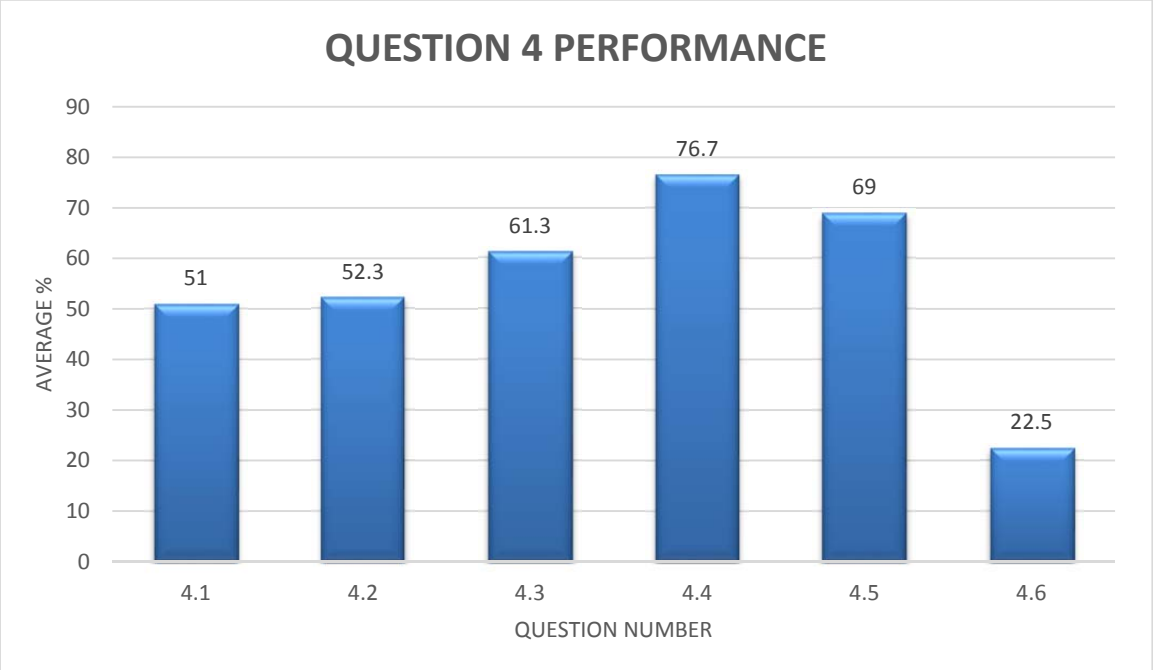
When dealing with Newton's laws teachers must revise forces and free-body and force diagrams intensively. Teachers must teach learners to always draw force diagrams to make answering of questions easy. Teachers must train learners to have all necessary problem-solving skills such that they are able to derive strategies to solve various problems. Learners must be exposed to problems that demand integration of different laws to solve one problem.

(d)	Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
Learners must understand key phrases in statements of Newton's laws and they must learn these statements with understanding. Use of free-body diagrams must be overemphasized to enhance question analysis. Learners must be taught to explain their answers to questions as this will augment scientific reasoning.	

QUESTION 4: Momentum and its conservation - {56 %}

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

Learners performed poorly in the question with an average percentage of 56%. Although learners did fairly well in 4.4 and 4.5 with 76.7% and 69% respectively but they performed poorly in 4.6 with an average of 22.5%.



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

Learners did not do well in answering question 4.1 (defining Isolated system). Most of candidates were giving examples of external forces and they would mention applied force as an example and lost marks. Question 4.2 was easy and most candidates calculated a change in momentum instead of just momentum. Question 4.6 was the worst performed question with 22.5%. Learners could explain their choice of an answer in 4.5 as was required in 4.6. Most learners failed to answer 4.5 correctly and lost marks because of application of negative marking.

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

Learners must be taught basics and be exposed to simple calculations before introducing more complex calculations. This will enable them to understand simple calculations and build from such calculations so that they be able to challenge difficult questions.

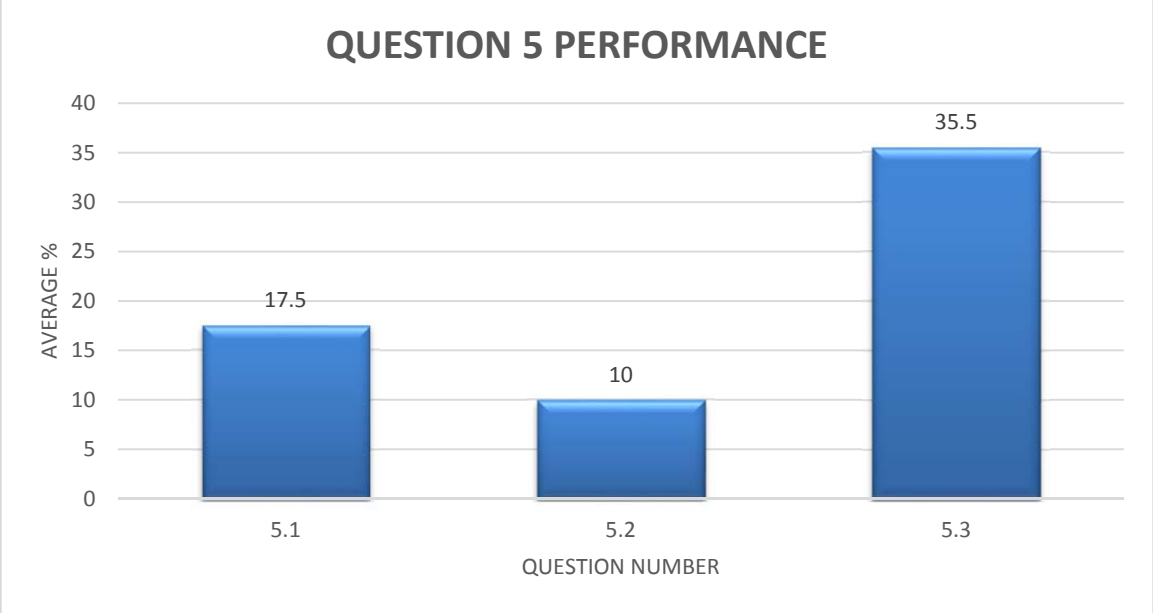
(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.

Learners must be exposed to questions that demand demonstration of an ability to explain their answers. They must be trained to acquire skills such as logical scientific reasoning and be able to logical reason out answers to questions. When teaching calculations educators must always scaffold activities starting from easy to complex.

QUESTION 5: Impulse and types of collisions - {25 %}

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

This was the worst performed question in the whole question paper. Candidates managed to get a lousy 25% in the question. Learners underperformed in all sub-questions in this question 5.3 the better performed question with only 35.5%.



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

Questions were very easy but seemingly candidates did not properly prepare for the paper. Question 5.1 (17.5%) demanded learners to explain ***"Inelastic collision"*** and they failed to collect marks which were easy to get. When explaining the concept most of them would explain it either in terms of momentum or kinetic energy only. Majority of learners would omit the word ***total*** in their explaining which was a misrepresentation of the concept. Some learners answered the question incorrectly as they would give a difference between elastic and inelastic collisions. In question 5.2 learners performed at 10% as they could not define net force in terms of momentum, another give-away question. They would omit key words such as ***rate*** and ***change*** in their definitions. Question 5.3 required learners to use Impulse-Momentum theorem equation to answer the question. They could not do that as they failed to choose appropriate formula, substituting in the formula and also giving direction in the final answer.

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

Learners must be taught explanation of concepts and how to choose appropriate formula to answer a particular question. Learners must learn definitions as they are in the Examination guidelines.

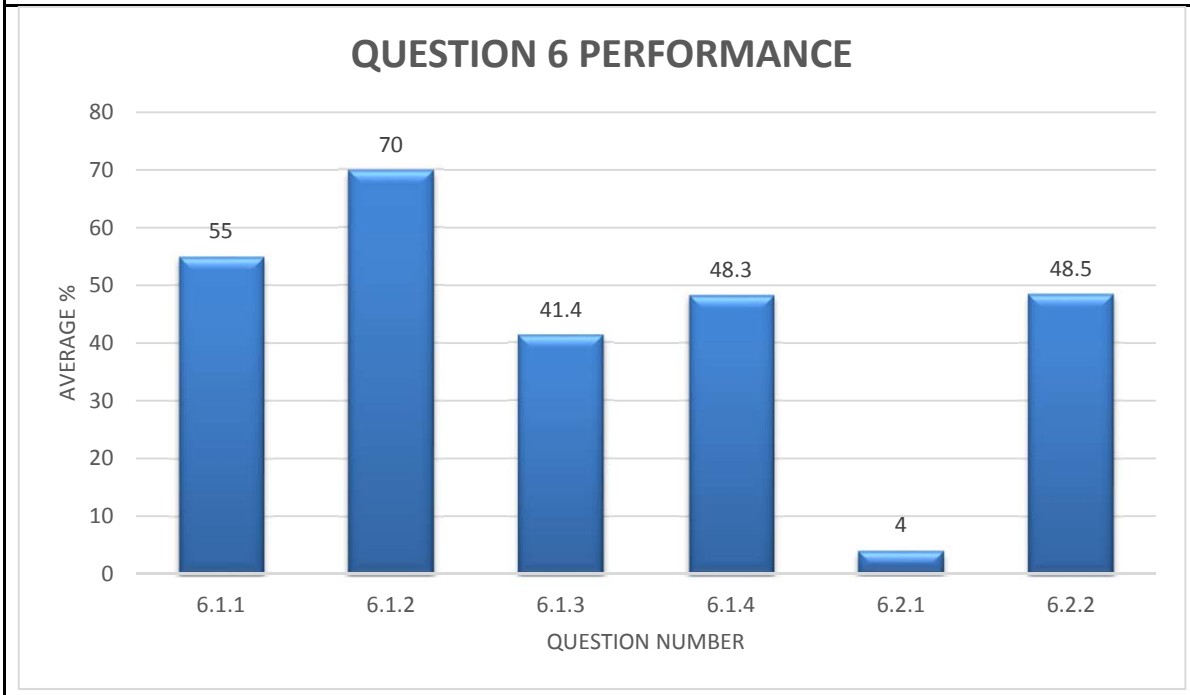
(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject, teacher development etc.

Levels of preparedness were to low and learners were not adequately taught. Giving learners problem-solving skills was not attended to by educators. Subject advisors must train educators on both content knowledge and also methods of effective teaching.

QUESTION 6: Work, energy and Power - {49 %}

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

The question was poorly answered at an average of 49% especially with 6.2.1 at a low performance of 4% which was the most poorly answered.



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

Learners had trouble with identifying the formula to calculate the power for an object moving at a constant velocity, in question 6.2.1. they had problems with calculating the power of the worker in 6.2.1. Learners could not define mechanical energy correctly to obtain the full marks allocated.

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

When teaching power, the formula to calculate it using constant velocity should be emphasized that they must not exclude the average in the formula $P_{ave} = Fv_{ave}$. Learners should be taught how to collect data when doing calculations so that they know what they are given which will make it easier to choose the correct formula. Therefore, more practice questions should be given to the learners to answer so that the principle is imparted in them.

With the definition class tests with only definitions can be administered so that they get to know them well and the CAPS Document and Examinations must be used at all times by both teachers and learners.

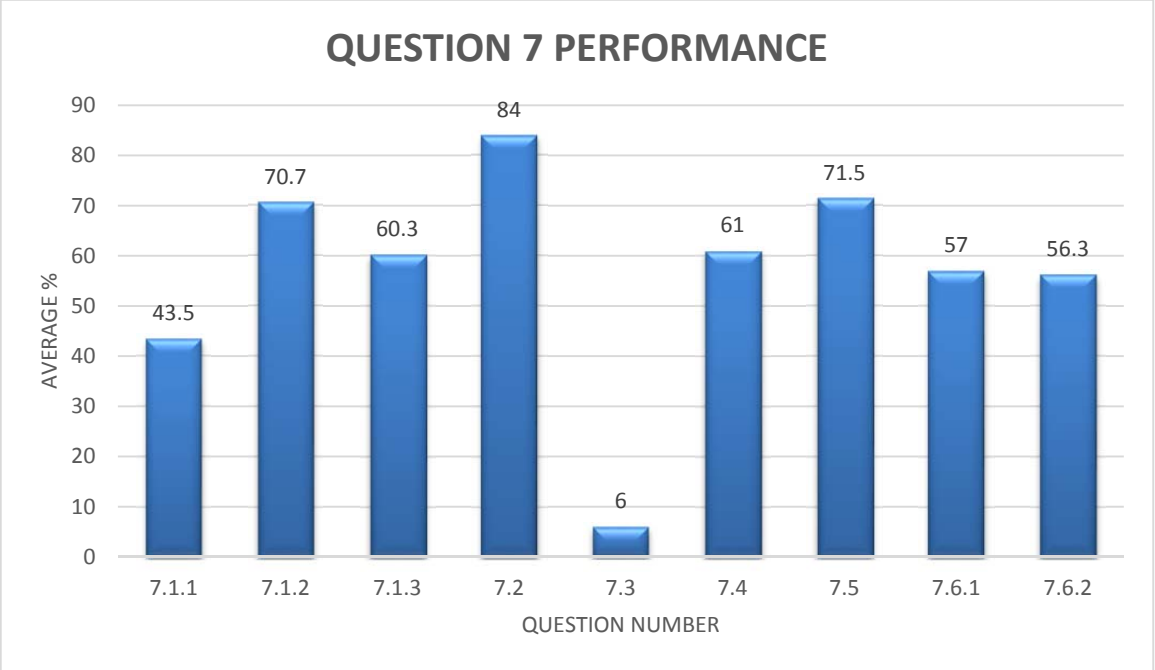
(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.

Guidelines must be given to educators about using all the necessary documentation for teaching and learning. Also, training must be done by the district to ensure that there is no content gap.

QUESTION 7: Elasticity, stress, strain and hydraulics - {57 %}

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

Question was poorly answered as compared to last year when it was 63.2%. Learners performed better in 7.6.1 and 7.6.2 at 56.3% and 57% respectively. They did well in 7.1.2, 7.2, and 7.5. The worst performed question was 7.3 at 6%.



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

7.3 was answered poorly by the learners due to misconceptions on perfectly elastic bodies hence they could not give two examples of such bodies as per examination guidelines. With the definition of elasticity in 7.1.1 learners were writing the definition of a perfectly elastic body not what was expected from the question, which led to poor performance in the sub-question.

Learners were not able to calculate the pressure in 7.6.1 due to conversions because most could write the formula, substitute the force correctly but most of them could not calculate the area. If a learner was not able to calculate the area as they were given the diameter in 7.6.1 then even in 7.6.2 they could not answer the next question correctly.

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

When dealing with elasticity, the CAPS and examination guidelines must be consulted so that clear instructions are given to learners. Learners must be given examples of perfectly elastic bodies and plastic bodies which are in the Examination guidelines.

Expose learners to conversions of units as they have a huge impact in the subject, where they have to convert diameters, arears, pressures etc.

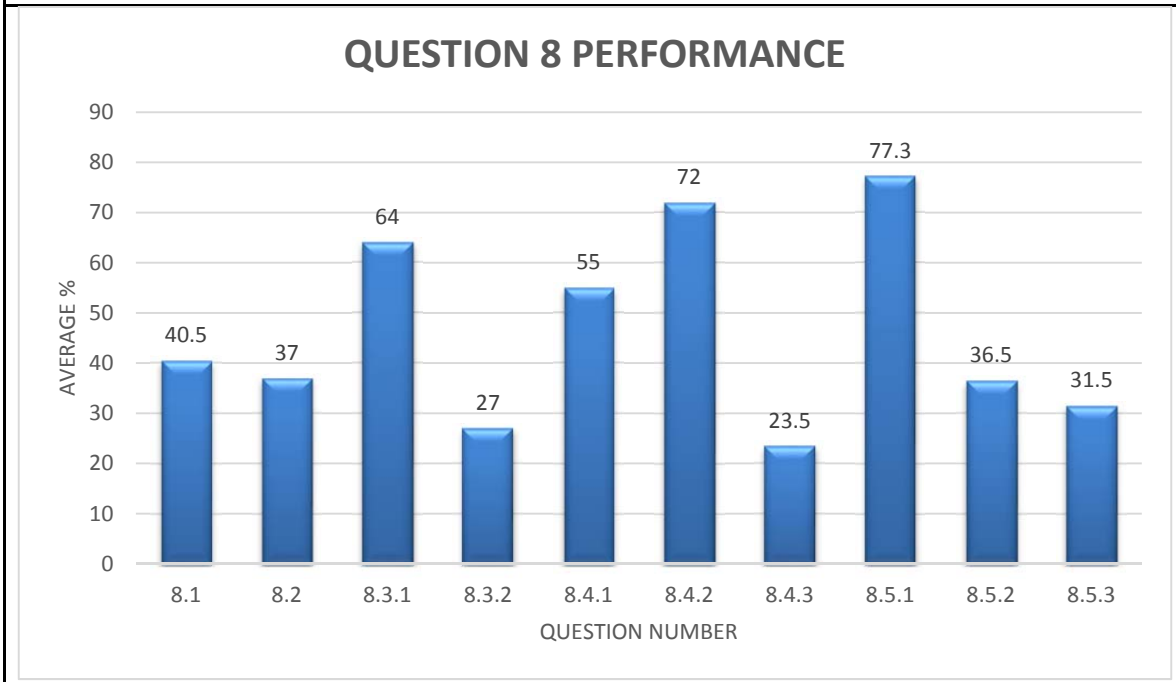
(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.

The Caps document and the examination guidelines must be followed during the teaching and learning period.

QUESTION 8: Electricity, doping and capacitors - {47 %}

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

Poor performance in this question especially 8.4.3 with 23,5% average percentage, then 8.3.2 at 27%, question 8.5.3 also poorly answered, in ascending order 8.5.2 learners struggle to answer at 37%, slight improvement in 8.1 at 40,5%, then 8.4.1. was performed at an average of 55%. In 8.3.1 learners were able to perform better at 64%. There was great improvement in 8.4.2 at 72 % and 8.5.1 also learners were able to attempt the question.



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

Learners were not able to explain the relationship between capacitance and distance. They were drilled to know factors that affect it but not how they can either increase or decrease the capacitance.
Learners don't know the formation of n-type and p-type semiconductors which led to then not being able to answer question 8.3.2 based on the formation of an n-type semiconductor. Learners were not able to define a semiconductor and do not know the types of semiconductors, basically there is a content gap in this topic hence the poor performance in 8.1, 8.2 and 8.3.
Learners also struggled with the relationship between current and heat in a circuit which led to poor answering. There is an improvement in the application of Ohm's Law. Learners struggled with appliances that use the heating effect of electric current.

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

When teaching Capacitors, the CAPS Document and Examination Guidelines must be used as guiding documents during teaching and learning so as to prepare learners for the final examination. Learners should be able to define all the key concepts in the topic as per instruction, know the different types of conductors.
With Doping learners should be able to define the process and understand how n-type and p-type semiconductors are made without any misunderstanding since this is a topic is where learners are to get marks.
When electrical circuits are taught, heat should be incorporated so as to expose learners to the real-life

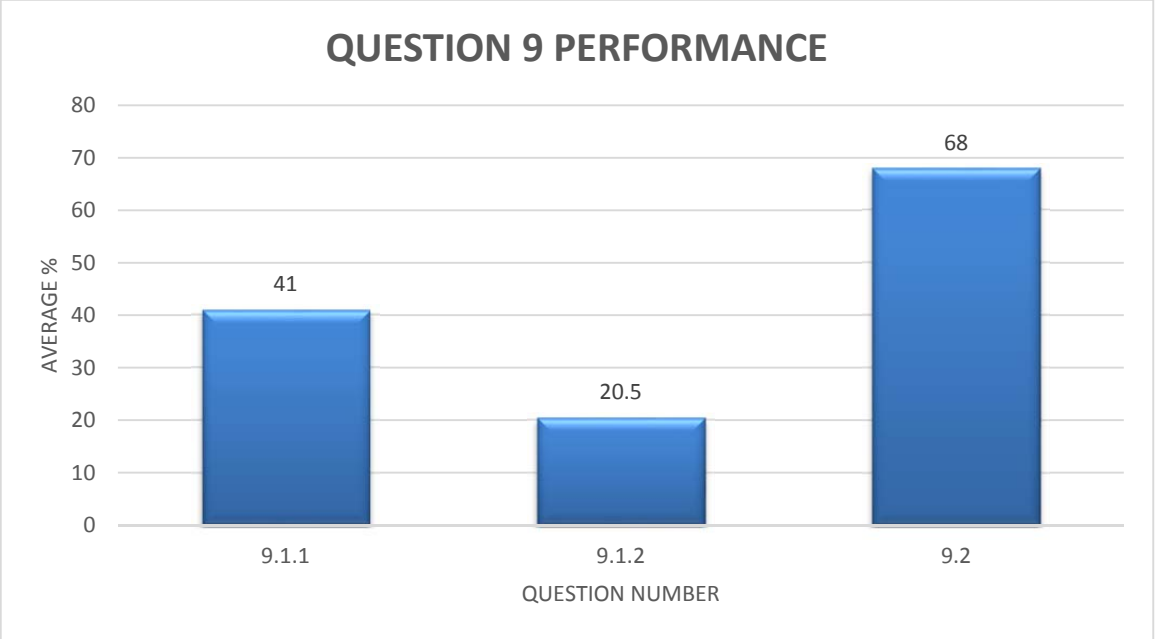
applications of electric circuits. Revision should be done thoroughly on Ohm's Law with calculations.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
Topics should be given priority as the other topics to assist the underperforming learners to attain marks.

QUESTION 9: Electromagnetism - {47 %}

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

The question was poorly answered with an average of 47% which is still an improvement from the previous year. Learners performed better with question 9.2 with 68%, followed by 9.1.1 at 41% then most poorly answered is 9.2 at 20,5%.



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

Starting with the most poorly answered question which is 9.1.2 where learners had to state two ways in which the deflection of the galvanometer needle could be increased. There's a lot of misconceptions with difference between factors that affect the induced emf and how to increase or decrease the reading on the galvanometer. In 9.1.1 learners were not able to state the whole of Faraday's Law, they are only able to either state the first or last part of the Law. With 9.2 most learners were able to calculate the magnetic flux linkage even though they did not get the S.I unit and some are still not able to calculate it.

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

Learners were trained on factors that affect the induced emf from last year's question paper, but this year they were assessed according to the experiment where they had to "determine the effects of the change in magnetic field or magnetic flux". The experiment has to be done so that learners understand these factors practically than theoretically as will be able to recall what they have done than what they are told. With the law, proper teaching must be done and avoid focusing on one part of the Law but the whole Law is worth 2 marks which states that *"When the magnetic flux linked with coil changes, an emf is induced in the coil. The magnitude of the induced emf is directly proportional to the rate of change in the magnetic flux."*

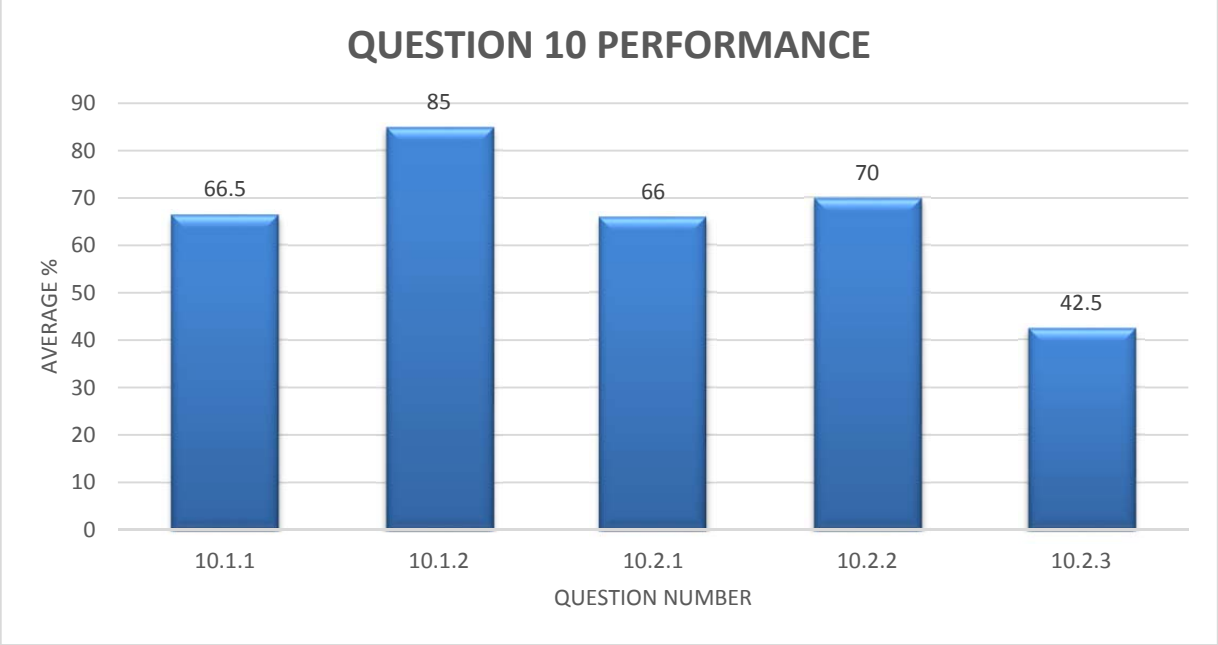
Do more activities with calculation so that learners have more practice and able to do the calculations and attempt the questions.

(d)	Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
Should make sure that learners are exposed to experiments and proper terminology according to the CAPS Document and examination guidelines is done to avoid unnecessary misconceptions.	

QUESTION 10: Generators and transformers - {68 %}

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

The question was answered better than last year as there is a 3,6% improvement from 64,4% to 68% this year. Question 10.1.2 has been most well answered at an average of 85% from all the sub-questions in the question, then 10.2.2. with 70% respectively 10.1.1 with 66,5% then 10.2.1 at 66% and 10.2.3 least well answered at 42.5%.



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

In 10.1.1 the reason for not great performance is that some learners where not able to define a step-down transformer as expected from them which led to a slightly above average performance. With 10.1.2 the performance was great as learners were able to calculate the primary windings. In 10.2.1 learners made lots of mistakes when having to label the components, learners made errors and that indicated they are not well exposed to DC/AC generator diagrams. Question 10.2.1. better performance as learners were required to identify the component that enables DC generator to produce current even so they could have correctly guessed the answer. Lastly 10.2.3 was the most poorly answered, learners were not able to differentiate between an AC and DC generators which led to misconceptions.

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

To improve the teaching and learning in these topics, learners must be taught by the educator using the CAPS Document and Examination guidelines as a reference of what is expected from the learner by the examiners. Design activities that will expose learners to AC and DC generator diagrams and be able to label them with ease which will make learners be able to differentiate between the two. Learners must also know functions of the components of generators and be able to differentiate between the two types by referring to structural components and functions.

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

Learners showed lack of knowledge on Generators, therefore, educators need to do the topic thoroughly and use past question papers as part of revision to prepare the learners.