Section A: (Questions 1, 2 & 3)

This section was generally well answered.

Question 1

This question examined candidates' ability to recall knowledge. All candidates performed according to expectation, although it was disappointing that the candidates in the bottom range (below 40%) performed so poorly – an indication that the majority of them did not prepare well enough for the examination.

Question 2

This question examined candidates' knowledge of the subject. Candidates were given incorrect statements which they had to correct.

Question 2.2 was poorly answered – candidates had little understanding of the principle of conservation of linear momentum. [$\Delta p_{initial} = -\Delta p_{final}$] Momentum is a vector quantity and, for it to be equal, both magnitude and direction have to be equal. Many candidates could not interpret this fundamental property of a vector quantity.

Question 3

Questions 3.1, 3,2 and 3,3 were answered very well.
Question 3.4 was poorly answered.

- One reason for some candidates' poor performance in this question was that the discharge of a capacitor in a circuit was not well understood. More emphasis should be placed on the teaching of this aspect – it is normally taught in Grade 11.

Some information on the discharge of capacitors is given below:

During the discharging of a capacitor
- the charging current decreases from an initial value of V/R to zero.
- the potential difference across the capacitor plates decreases from V to zero when the capacitor is fully discharged.
- the potential difference across the capacitor and the potential difference across the resistor are always equal.
- the potential difference across the resistor (given by $V_R = IR$) decreases from an initial value of V to zero when the capacitor is fully discharged.

Question 3.5 was reasonably well answered, which indicates that, while some centres had a good understanding of the operation of lasers, at other centres this section was not taught and consolidated well enough for candidates to apply their knowledge with the necessary confidence.

Section B

Question 4

4.1 Well answered.

4.2 Although reasonably well answered, candidates' understanding of control variables, i.e. the precautions to be taken to ensure validity of results during an investigation, was not always sound. Some candidates gave safety precautions – which was not what was required.

4.3 A multi-step calculation – reasonably well answered– candidates applied the equations of motion with confidence.

Question 5

This question was poorly answered

The Work-Energy Theorem is $W_{net} = \Delta E_k$

$W = F\Delta x \cos\theta$ and NOT $W = F\Delta x$

5.1 Many candidates lost at least 3 marks for an incorrect application of the Work-Energy Theorem.

5.2 Poorly answered – candidates lost all the marks if the weight was indicated in the free body diagram. The question required a force along the plane, and not any other forces in any other direction.

5.3 Once again poorly answered because of the incorrect application of the Work-Energy Theorem.

Question 6

6.1 Well answered– candidates applied the conservation of linear momentum with confidence.

6.2 Poorly answered – many candidates did not know the condition necessary for proving whether a collision was elastic or not. They used $\Sigma p_{before} = \Sigma p_{after}$ or Impulse viz $F_{net}\Delta t = m\Delta v$.

6.3 Once again poorly answered because of the incorrect application of the Work-Energy Theorem.

Question 7

The question examined the application of the Doppler Effect. A great improvement when compared to last year’s responses.

7.1 Well answered.

7.2 Reasonably well answered – very few candidates knew that the reason for the decrease in the wavelength was that the waves in front of the moving source are compressed as the source moves towards the stationary observer.

7.3 Well answered – some candidates still confused frequency of source with frequency of listener.

Question 8

From the responses of candidates it was apparent that light had been taught, but not pigments.

8.1 Poorly answered – candidates did not know the definition of a *pigment*.

8.2 Poorly answered – answers had to be interpreted from the information given in the passage. It was evident that some candidates had a reading problem and could not assimilate and interpret information. Teachers need to use “passages” as part of assessment.

8.3 Reasonably well answered – centres seemed to be focussing on light, rather than on light, paints and pigments.

8.4 Well answered.

Question 9

9.1 Well answered.

9.2 Candidates found this question quite difficult. They could not explain the observations clearly.

Question 10

10.1 Well answered – many candidates applied Coulomb's Law with a great deal of confidence. It is, however, still a concern that candidates had problems converting cm → m and μC → C.

10.2 Well answered– although some candidates failed to apply the inverse square relationship successfully i.e. $F \alpha \frac{1}{r^2}$

10.3 Poorly answered – many candidates could not interpret the net electric field as the vector sum of the individual fields at that point.

10.4 Very poorly answered – candidates did not know that they had to apply the formula $U = \frac{kQ_1Q_2}{r}$ to solve this problem.

Question 11

Poorly answered. It seems as if this topic (Electric circuits) still proves to be a challenge to many candidates, even though extensive teaching, consolidation and revision is done.

11.1 Candidates' understanding of "emf" was still lacking – poorly answered.

11.2 The multi-step calculation proved to be very challenging for most candidates. The application of Ohm's law ($R = \frac{V}{I}$) was simply done at random. There was no insight into the use of this very important equation. (It is important to note that this section of work is done from Grade 9 onwards, including the Grade 12 year.)

11.3 Once again very poorly answered. The effect on current strength and potential difference if resistors are removed was not clearly understood. Candidates lacked the ability to explain the effect that changing variables would have on the overall equation.

Question 12

The ability tested in Question 11 was tested here again, but this time AC was used instead of DC. The performance of the candidates was similar to that in Question 11.

12.1 Very poorly answered.

12.2 Reasonably well answered – a straightforward substitution of the answer obtained in Question 12.1 into a new equation.

12.3 Reasonably well answered – a straightforward substitution of the answers obtained in Questions 12.1 and 12.2 into a new equation.

12.4 Once again explaining relationships, by changing one of the variables in the equation (in this case $P_{ave} = I_{rms}^2R$ and $P_{ave} = V_{rms}I_{rms}$), proved to be the downfall of many candidates.

Question 13

The majority of the candidates clearly did not understand the basic fundamentals of electrodynamics.

13.1 Very poorly answered – candidates did not know the principle on which the generators operate.

13.2 Interpretation of data – poorly answered.

13.3 Reasonably well answered.

13.4 Poorly answered – many candidates omitted the word "commutator" in their answer and therefore lost the mark. "Split-ring" was not accepted.

Question 14

14.1 Very well answered.

14.2 Very well answered.

14.3 Even though this was a multi-step problem, many candidates applied the formulae c = fλ ; E = hf as well as $E = W_o + \frac{1}{2} mv^2$ with reasonable confidence. Most candidates performed well in this question. Candidates lost marks if they used a variation of the equation given on the data sheet.

14.4 Poorly answered – many candidates lost marks for failing to mention that more photons strike the plate per second and therefore more electrons leave the plate per second, and thus the current increases.

14.5 Well answered.