Part 1: Statistical Information

Table 1: Distribution of Grades awarded in May 2011

<table>
<thead>
<tr>
<th>GRADE</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>Abs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>53</td>
<td>103</td>
<td>251</td>
<td>104</td>
<td>76</td>
<td>141</td>
<td>30</td>
<td>758</td>
</tr>
<tr>
<td>% of Total</td>
<td>6.99</td>
<td>13.59</td>
<td>33.11</td>
<td>13.72</td>
<td>10.03</td>
<td>18.6</td>
<td>3.96</td>
<td>100</td>
</tr>
</tbody>
</table>

Part 2: Comments regarding candidate’s performance

The following points were noted:

- There were many instances where the unit was either not quoted or else a wrong unit was quoted.
- There were many instances where candidates did not know how to use their calculators correctly, subsequently they were obtaining incorrect final answers even though the formula used and the input of values were correct.
- A number of mathematical mistakes were made, especially when trying to change the subject of the formula and when working with fractions.
- A number of candidates could not read the correct coordinates from graphs.
- Candidates were also making a lot of careless mistakes – copying incorrectly the values from the question; forgetting to square values/forgetting to use the square root.
- Some candidates gave answers without giving the relevant equations

**Question 1**

a) Question was generally answered correctly. Quite a number of candidates used the formula \( s = \frac{1}{2} at^2 \) and proceeded correctly to obtain a correct final answer.

b) Correct in most cases. There were however instances when candidates added some distance to the 6 m so as to make sure that the stuntman makes it into the water and not land on the rocks!

A few candidates did not differentiate between vertical and horizontal motion.

**Question 2**

a) Candidates rarely quoted the range as 0 N to 150 N. Many just quoted the force at which the elastic limit was exceeded. Others found difficulty in finding the exact point where the graph started to curve – some even commented that the grid lines were too faint! Many knew that if Hooke’s Law is obeyed the given graph should be a straight line; but many did not point out that the force should be proportional to the extension.
b) The majority of candidates tried to find the work done from the equation: Work = force x distance. Very few worked this part correctly using the appropriate formula. A number did not convert the extension to SI units.

c) Very few candidates gave a correct answer. Many quoted the extension when the force was 200 N or 210 N. Others subtracted the extension of the wire when the force was 150 N (or another force greater than 150 N) from the extension of the wire when the force was 200 N or 210 N.

**Question 3**

a) Few candidates explained in words what is meant by a real image. Most of the few who attempted to explain, just said that it is an image which is obtained on the other side of the lens as the object. However, almost all candidates drew ray diagrams depicting a real image. But, the ray diagrams which were drawn lacked accuracy and detail. Many did not point out where the object was situated; others did not draw arrows on the rays; the distance of the point from the optical centre varied; others were not careful when drawing rays.

b) Many candidates worked this part correctly using the real is positive convention. However many did not state the nature of the image formed.

**Question 4**

a) The complete correct version of Newton’s Law of Gravitation was given in just a few cases. Most of the others had a vague idea of what the law states.

b) The majority gave the unit in terms of the base units.

c) Many candidates knew what formula to use in order to find the distance. They substituted the correct values but found difficulty in computing the equation and obtain the correct answer. Quite a number of candidates did not state whether the force was attractive or repulsive. A substantial number of those who answered this part of the question said that the force was a repulsive force.

**Question 5**

a) Many candidates read the temperature from the graph incorrectly. It seems that many found difficulty in using the given scale. A number did not attempt to convert the temperature to degrees Celsius. Those who did usually used the correct conversion.

b) Very few candidates completed this part correctly. Many did not know what formula to use; others quoted the formula incorrectly. Some knew the formula but did not succeed in reading correctly $R_0$ and $R_{100}$. 
Question 6

a) Almost half of the candidates knew how to find the heat supplied, but a number did not change the time to seconds. Quite a number of candidates used the formula $Q = It$. Little did they realise that $Q$ in this formula represents the charge and not the heat energy!

b) Many used the correct formula $Q = mc\Delta\theta$. However some did not input correct values in the formula. Others inputted correct values but did not compute correctly the formula. After including the calculation some did not state whether the water starts boiling or not.

c) A number gave assumptions related to the experiment which is used to find the specific heat capacity and not an assumption which has been made in calculating the required value.

Question 7

a) In this question about capacitors, the most common mistakes found to be made by candidates in the first part, were either omission to include the relative permittivity in the calculation of the capacitance and even more often, the thickness of the polythene was taken to be its width rather than its true thickness of 100 micrometres. Relatively a few number of candidates managed to provide a correct assumption for the answer to the first part.

b) As for the second part of the question, the mistakes were various and ranged from using the incorrect equation to incorrect calculations and to using the incorrect value for the separation between the plates.

Question 8

a) In this question, students did well in the first part of the question. This is to be expected when the question asks for a statement of some physical law, as was the case for this question about electromagnetic induction.

b) The second part of the question was subdivided into three parts. In the first part, the candidates had to work out the velocity with which a pencil had to move to create an e.m.f across its ends. Most of the candidates did well in this part. As regards the second and third part, some candidates incorrectly answered that the law that is used to determine the direction of current flow in the pencil is Fleming’s Left hand rule. This somewhat indicates that these candidates did not have proper knowledge on when and how to use Fleming’s laws. On a positive note, there were candidates that managed to indicate correctly the direction of current flow. Of these candidates, however, there were some who chose the incorrect end of the pencil as being the positive end. These candidates were probably misled by
the fact, that they did not consider an outer circuit in order to determine the positive end of the pencil.

**Question 9**

a) This question about current electricity was divided in two parts. As for the first part, a common (and recurring from year to year) mistake made by candidates in finding the current flowing through the circuit, is that they take the supply voltage as being acting only on the one component of which they know its resistance. They do not take into consideration other components that are connected in series and which affect the current flow. This leads to incorrect calculation of current flow and consequently that of resistance.

b) As for the second part of the question, the main mistake made by candidates was failure to read the question carefully to understand that one terminal of the voltmeter was connected to the middle of the resistance wire. Hence the resistance of the section of wire in parallel with the voltmeter was half that of the total resistance of the whole wire. This led the candidates to incorrectly determine a solution to this part of the question.

**Question 10**

a) This question was about oscillations. Almost all candidates managed to answer the first part correctly. Those who failed to do so did not manage to do very well in the other questions either.

b) As for the second part of the question, the vast majority of candidates incorrectly found the velocity of a particle on the wave by dividing the displacement at that point by the time at that point. These candidates did not even consider drawing a tangent to the curve at that point and finding the gradient of this tangent to find the velocity of the moving particle.

c) As regards, the third part of the question, only a few candidates managed to somewhat explain that the velocity of the particle is zero when the gradient of the tangent drawn to curve is zero, and that this happens at the crest and the trough of the wave.

**Question 11**

a) The majority of the candidates managed to do well in this question. Those who failed to do well did the incorrect calculations that were necessary to find the data for plotting the graph. This is somewhat unacceptable that
students at this level still find difficulties in carrying out number
calculations with a calculator.

b) Most candidates managed to plot a correct graph with all the necessary
labelling of the axis and graph title.

c) As regards the third part of this question, again most candidates managed
to determine Young modulus from the gradient and to determine its value
correctly.

d) As for the last part of this question, most candidates managed to give a
good explanation of how the resultant of the components of the tension in
the wire is equivalent to the weight supported by the wire.

The most popular questions answered were Number 12 on momentum and
number 15 on nuclear physics. They were followed by question number 13 and
the least answered was question number 14. Many of those who did this question
got most of it wrong.

Question 12

(a) The majority pointed out that there was a direct relationship between force and
momentum and even gave the equation but quite a number started by saying
that force is directly proportional to the acceleration and momentum but failed
to connect them.

(b) Many stated that the two objects moved together after collision and that
momentum is conserved but failed to state that K.E. is lost. Quite a few said
that energy is lost.

c) (i) As regards the graph many drew the correct shape but others
considered the time of collision to be negligible while others did not
consider the negative part of the graph, but simply considered velocity
as speed, (Drew graph in one quadrant.)

(ii) The calculation was done correctly by the majority.

(iii) Unfortunately there were many who did not consider the negative sign
of the velocity and finished with an answer of 0.96 Ns instead of 3.36
Ns.

(iv) The method for this part was correct but obviously, those who got a
wrong answer in the previous part got a wrong answer to this part but
errors do not carry over.

(v) The kinetic energy lost was worked out by many. Some used other
values for velocity. Others subtracted 10 from 18 and then worked out the K.E.
(vi) Quite a few considered the two objects as one after collision. Many worked out the problem correctly.

(vii) Only a few worked it out correctly. Many worked part of it giving answers like 6J, 13.44 J or 19.44 J.

Question 13

(a) The majority answered this part by stating what $\Delta Q$, $\Delta U$ and $\Delta W$ stand for and not by doing particular reference to the situation. Only a handful did so.

(b) (i) and (ii) The majority of students worked these correctly but some inverted the numbers. They do not know how to change the subject of the formula.

(iii) This was correctly answered by many but quite a few used the equation $\Delta Q = mc\Delta \theta$ which is wrong.

(iv) This was correctly worked by many but some considered a particular volume obtained in (i) or (ii) only and not a change in volume. A few tried to use $W = Fd$.

(v) Many worked it out correctly. Nearly everybody used the correct equation but some did + instead of -.

(c) Many mentioned that water molecules become free but only a few mentioned that the K.E. increases.

Question 14

(a) (i) Few of those who did this question got it right. Some considered only the 8 V, others the 10 V.

(ii) Those who worked this out either used the 8V or the 6V or the 10 V.

(iii) Many managed to work out the current but then out of these only a handful subtracted this from 2, the rest used the value obtained.

(iv) Only a handful got the right answer. Many went through very complicated working.

(b) (i) Only a few got the correct diagram however there were quite a number who did not know the symbol for the thermistor. A few drew the resistors in series.

(ii) The majority related the resistance with temperature.

(iii) A few found the resistances. Many tried to substitute directly in $P = VI$ or $P = I^2R$. Out of those who worked the resistances, only a few included the internal resistance.
Question 15

(a) Many knew what a nucleus is but many referred to the nucleon as the nucleon number stating that it is the number of protons and neutrons together.

(b) (i) Many got these right.

(ii) Many wrote the correct equation but quite a few got the mass number and proton number wrong.

(iii) Many got this right but quite a few forgot the square of c when it came to the calculation. Others used the correct method but used only 1.008665 while others added this number to the other two.

(c) (i) The majority got the right numbers.

(ii) Many do not know how to change MeV to eV. Many multiplied by 1000.

(iii) Majority correct.

(iv) Nearly everyone worked out that there were 5 half lives but quite a number failed to work the mass. There were all kinds of numbers.

Chairperson
Board of Examiners
July 2011