Part 1: Statistical Information

Table 1 shows the distribution of grades awarded to students in the May 2007 session.

Table 1: Grades awarded in the May 2007 session.

<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>44</td>
<td>94</td>
<td>235</td>
<td>94</td>
<td>87</td>
<td>123</td>
<td>13</td>
<td>690</td>
</tr>
<tr>
<td>% of Total</td>
<td>6.4</td>
<td>13.6</td>
<td>34.1</td>
<td>13.6</td>
<td>12.6</td>
<td>17.8</td>
<td>1.9</td>
<td>100%</td>
</tr>
</tbody>
</table>

Part 2: Comments regarding performance

Section A

Question 1:
Many of the candidates did well in this question. The main problems encountered included: incorrect point of action of the forces acting on the body; incorrect direction drawn to indicate the frictional force. Most of the candidates who drew the correct forces were also able to work out the value of the frictional force required.

Question 2:
A good number of candidates managed to work this question correctly. On the other hand, there was also a significant number of candidates who revealed that they had no idea of what projectiles are and as a result, these candidates could not be awarded any marks.

Question 3:
Many of the candidates quoted the correct equation but then did not square the radius in their calculation. Many other candidates also used a value of 1m rather than 2m for the distance between the spheres. Many candidates knew the method needed to work out the value of the acceleration. Many were also able to relate the fact that no electric force was present because there was no charge present on the spheres.

Question 4:
Most of the candidates were able to work part (a) of this question correctly. Many problems were, however, encountered in the second part of the question. There were candidates who worked out the new combined resistance but did not realise that the current in the circuit had changed and used the value for the current in the first part of the question rather than working out a new correct value for the current. Some candidates did not add up the resistances in series correctly.
Question 5:
This question posed a big problem to many candidates, and performance was overall quite weak. Part (a) was the easiest but even here, many did not square the velocity when working out the resulting value for the kinetic energy. The second part proved the most difficult and many had no idea how to tackle it. A number of candidates used the correct relationship between the electric force in part (b) and field strength in part (c).

Question 6:
Many did give the basic difference between longitudinal and transverse waves although a number of candidates did not refer directly to the direction of oscillation of the particles constituting the waves. While many candidates managed to figure out how to use the graphs provided to work out the speed of the wave, yet, there were many who did not consider the units for the quantities provided or else made incorrect conversions in calculations. The main problem was with the unit of time – the millisecond (ms).

Question 7:
Many candidates could identify the type of image formed, as well as the image distance from the lens. The main problems which were encountered were in working out the focal length of the lens. When using the real-is-positive sign convention, the nature of the image and the image distance were not used with the appropriate signs.

Question 8:
Many candidates were able to work out the strain correctly. There were some candidates who confused the equations for stress and strain but these were only a few. In part (b), there were some candidates who did not read the value of the force correctly, while others did not realise that the extension was of the order of $10^{-3}$ m and so could not give a correct final answer. Very few candidates realised that in part (c) they had to find the area under the graph.

Question 9:
In part (a) candidates resorted to various explanations, even if some were incorrect, of how to test for heat exchange between the systems when these were brought in contact. Most students referred to testing the systems by measuring the temperature of each using a thermometer. However, some of the students mentioned placing systems A and B in contact, when the question specifically advised against this. Many did not realise that without using a thermometer, one would not be able to verify whether heat transfer could occur or not. Parts (b) and (c) were manageable for most candidates.

Question 10:
While parts (b) and (c) were easily managed by the candidates, yet, very few candidates could provide two valid reasons as to why the count rate was smaller than the activity of the radioactive source. Correct answers which were proposed included the possibility that other types of radiation were being emitted by the source, or that the detector only recorded the $\alpha$ radiation that bombarded its window or that the $\alpha$ particles are short ranged.
Section B

Question 11:
(a) Nearly all students gave correct values for \(\sin \theta_1\) and \(\sin \theta_2\) in the table of data.

(b) Nearly all students obtained full marks for the graph plotting.

(c) Quite a number of candidates did not use the graph to obtain values for the calculation of the gradient. Full marks were awarded when candidates transformed the given equation into the form: \(y = mx + c\) and then calculated the gradient of the graph to obtain a value for \(n_2\) using the co-ordinates of two points which were obtained from the graph.

(d) In this part of the question, some students who, for example, just made reference to ‘take accurate readings’, were not mentioning any precautions specific to the experiment in question. The following is an example of a precaution which was accepted: ‘avoiding parallax errors when reading angle values’.

Section C

Question 12:
This question was attempted by a large number of candidates. In part (a) of the question, many candidates did not know how to give the meaning of a vector quantity. Many considered kinetic energy as a vector quantity since kinetic energy depends on the velocity, which is itself a vector quantity. As regards part (b) of the question, many students got confused when they came to adopt a sign convention for velocity and acceleration, distinguishing the upward from the downward direction. Candidates who performed poorly in this question had trouble with the basic knowledge related to velocity-time graphs. They did not show knowledge that the distance travelled can be obtained from the area under the graph and that acceleration can be found from the gradient of such a graph. There were students who even read values incorrectly from the graph.

Question 13:
Most candidates who attempted this question did quite well. As regards parts (a), (b), (c), (d) and (e) of the question, most of the students succeeded in drawing the correct circuit and gave a correct answer to the questions posed. As regards part (f), very few students succeeded in answering correctly, and those who did, gave incorrect reasons for their answer. It seems that students were unable to come to the conclusion that there was a potential difference between X and Y, and that whenever there is a potential difference between two points, then there will be a flow of current.

Question 14:
Most of the candidates who answered question 13, also answered question 14. Most of the candidates did well in this question. Those who did not do well in this question, had difficulties in part (a), and could not state Faraday’s and Lenz’s laws of electromagnetic induction. In part (b), diagrams drawn were incomplete, with directions for the movement of the bar magnet and arrows to indicate the direction of
the current in the circuit left out. Thus, true understanding was not made evident. In part (c) of the question, candidates lost marks when they incorrectly indicated the direction of current flow in the rod and could not work out the calculations required.

**Question 15:**
Candidates lost marks for not being able to answer part (a) correctly, when this related directly to basic ideas about waves which are stated in the syllabus. In parts (b) and (c), most candidates gave correct answers. Some, however, had problems distinguishing between interference, diffraction and refraction. In part (e) of the question, most students did well in (i) but failed in (ii). The answers given to the last part were various and ranged from “you only see white light” to “you only see darkness,” when a monochromatic red light source is used instead of white light.

Chairperson
Board of Examiners
July 2007