UNIVERSITY OF MALTA

THE MATRICULATION EXAMINATION

INTERMEDIATE LEVEL

PHYSICS

May 2014

EXAMINERS' REPORT

MATRICULATION AND SECONDARY EDUCATION

CERTIFICATE EXAMINATIONS BOARD

Physics

Intermediate Level

May 2014

Part 1: Statistical Information

The distribution of grades awarded in the May 2014 session is given in the table below.

GRADE	A	B	C	D	E	F	Abs	Total
Number	30	88	187	133	74	137	36	685
% of Total	4.38	12.85	27.30	19.42	10.80	20.00	5.26	100

Part 2: Comments regarding candidate's performance

Section A

Question 1

Most candidates answered part (a) of this question correctly. A number of candidates, however, had difficulty changing the unit of charge, the Coulomb, into its base units.

Some candidates gave the impression that they knew the answer to part (b), but could not explain it properly.

Question 2

In this question, many candidates ignored the given value of g, the acceleration due to gravity, and used 10 ms^{-2} instead. Part (a) was answered correctly by the majority of candidates, but a good number found it difficult to complete their answer to part (b). Candidates also had problems in answering part (c).

Question 3

In part (a) of this question, a majority of candidates made the wrong assumption that the tensions in strings A and B were equal. On the other hand, many found problems in answering part (b). The resultant force acting on the soft ball towards the centre of the circular path was often not considered.

Question 4

Many candidates found difficulty answering this question. In part (a), a good number of candidates ignored the fact that the temperature of the ice has to be raised to zero before the ice melts. In part (b), referring to assumptions made in the calculation to part (a), many just mentioned heat losses.

Question 5

In part (a), the majority of candidates found it difficult to relate the potential energy lost by the jumper to the energy stored in the cord, even when the question guided the candidate to treat the cord as an ideal spring. In part (b), many candidates wrongly assumed that the tension in the cord at the lowest part of the jump would be the same as the jumper's weight, saying they based their answer on Newton's third law of motion.

Question 6

This question showed how candidates found it relatively easy, especially in part (a), to recall something which they had tackled previously in their preparation for this examination – in this case the derivation of the equation $I = nAve$. Many candidates got full marks for their answers to this question.

Question 7

On the whole, this question was very poorly attempted. In part (a), a significant number of candidates did not know how to draw the electric field lines surrounding a charged sphere. In part b(i), many candidates tried to work out the electric field intensity using the equation $E = q/4\pi\varepsilon r^2$ instead of $E = F/q$. A majority of candidates could not answer part b(ii).

Question 8

This was another question which was poorly attempted. In part (a) the majority of candidates wrote correct nuclear equations representing alpha particle decay. In parts (b) and (c), however, most candidates had absolutely no idea of how to calculate the activity of Plutonium, and the initial power output from the same element. The few candidates who answered part (b) correctly, also gave correct answers to part (c).

Question 9

In this question candidates showed a good understanding of electromagnetism. In part (a) candidates who answered correctly, gave good explanations of the derivation of the equation F = Bqv. In part (b), the formula was used correctly and many scored full marks in this part. In part (c), candidates also seemed familiar with the fact that the larger the mass of the particle, the greater the radius of curvature of the path taken when the charge moves in the magnetic field.

Question 10

On average, the candidates gave correct answers to the three parts of this question. In part (a), candidates used the graph provided to calculate the speed of the wave. In part (b) there was again correct use of the formula to find the frequency. This then led to correct answers to part (c), finding the number of oscillations in 2s.

Section B

Question 11

The majority of the candidates scored high marks in the data analysis question. Even so, there were a number of common mistakes which is worthwhile mentioning.

In filling the table of results, a good number of candidates did not divide the given time t_{10}/s by 10, to find T (the periodic time). An incorrect answer for T^2/ s^2 was thus calculated. Some candidates seemed unaware of the importance of being consistent in recording values in the same column accurate to the same decimal place. Sometimes, candidates plotted T^2 on the x-axis, mistaking this for the y-axis. Units were not always included when labelling the axes. Moreover, not all candidates drew the best line to fit the points marked on the graph. Some candidates also encountered difficulties in writing the given equation in the form $y=mx + c$. This led to mistakes in calculations related to the gradient.

Section C

Question 12

This question about mechanics was not very popular with candidates and, from those who chose to answer it, only a small number managed to successfully identify the two forces acting on the sphere in part (a). There were even fewer candidates who managed to correctly derive the expression that relates the acceleration of the aeroplane to the acceleration due to gravity and the angle of inclination. Candidates performed poorly in part (a) but fared better in part (b) where the expression for the velocity v was derived and the common velocity of the two spheres was determined. Candidates who

managed to do these first parts of part (b) correctly, usually managed to obtain full marks in this part question.

Question 13

This question about optics was the most attempted question from Section C, but at the same time it must be said that this question was very poorly attempted. In parts (a)(i) and (ii) of this question, candidates performed rather well in recalling answers to questions asked. However, candidates found it difficult to determine the angle of refraction and the angle of incidence of the ray of light in the sapphire glass. In the majority of cases, candidates used incorrect trigonometric expressions.

In part (b), some candidates did not even manage to draw a correct ray diagram. This came as a surprise since the majority of candidates should have been exposed to drawing ray diagrams during their years of schooling at secondary level. Candidates showed they lacked the knowledge with understanding required to answer questions on this topic, at intermediate level.

Question 14

This question about current electricity was the second most attempted question in Section C. Candidates did generally well in part (a) of the question. There were mistakes, however, mostly due to incorrect circuit diagrams drawn with the voltmeter connected in series, instead of being shown connected in parallel. A thermistor was sometimes needlessly added to the circuit diagram, and a power source was sometimes lacking. Other common mistakes included sketching an incorrect *IV* characteristic for a filament lamp, with some candidates stating that the filament lamp is Ohmic. Most candidates managed to work part (b) correctly. As regards part (c) of the question, candidates had difficulties in recognising how the four resistors were connected. The candidates who resolved these difficulties then managed to complete their answers and to get a good mark for the whole question.

Question 15

This question about capacitors was the least popular question in Section C. Some of the candidates who attempted this question did well in part (a) but showed poor understanding in part (b). It was very surprising to note that some candidates could not work out the area of a circle. Some candidates also failed to correctly state that inserting a dielectric between the plates of a capacitor increases the capacitance. In part (c), the majority of candidates managed to correctly answer section (i) and (ii), but not section (iii). The latter required students to find the voltage across the resistor after 2 time constants had elapsed, then subtracting this voltage from the supply voltage, thus determining the required voltage across the capacitor.

As an overall comment, candidates did not get very high marks in this paper. Candidates need to be well prepared, not just to recall answers, but also to show that they have acquired knowledge with understanding.

Chairperson
2014 Examination Panel