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General Certificate of Secondary Education

Additional Science 4408 / Physics 4403

PH2FP Unit Physics 2

Report on the Examination

2012 examination – June series

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Additional Science / Physics
Foundation Tier PH2FP

General

There was no evidence that students had insufficient time to complete the examination paper. There was clear evidence that some students were not equipped with calculators.

Students should try to ensure that answers are written in the space provided. In the situation where students are unable to complete their responses within the allotted space, they must provide a clear indication that their response to the question is continued elsewhere in the booklet or on supplementary additional pages.

A common criticism was the seeming inability of students to take time to reflect on whether their responses were sensible in terms of what the question had asked. For example, Question 6(a)(ii), which required a student to look at some data about radiation doses, produced responses that suggested an average person might undergo 35 000 chest X-rays in a single year.

Question 1 *(Low Demand)*

(a) (i) Nearly two-thirds of students scored the maximum of three marks by correctly sequencing the three stages of one type of star. A common error was to include 'black hole' in the sequence.

(a) (ii) Over two-thirds of students chose the correct star. However, there were few correct reasons given for their choice, many students simply restating the similarity of the size of Alpha Centauri A and the Sun from the table.

(b) Only a third of students could correctly identify the process by which energy is given out in stars.

Question 2 *(Low Demand)*

(a) (i) About two-thirds of students correctly added the resistances together to give an answer of 15.

(a) (ii) Just under half the students were able to use the answer to part (a)(i) to correctly calculate the reading on the voltmeter. The most common error seen was dividing by the current rather than multiplying by it.

(a) (iii) Only a third of students scored this mark. Most students thought that using a higher value resistor would cause an increase in the current.

(b) Only a small minority of students identified Y as being the oscilloscope trace for a d.c. current, with even fewer students stating a correct reason for their choice.

Question 3 *(Low Demand)*

(a) (i) Over three-quarters of students correctly showed the direction of the friction force. Most incorrect responses involved arrows at various angles indicating where this force was being applied between the crate and the floor rather than the direction of its action.

(a) (ii) Just under a third of students scored both marks in this question, the incorrect responses being mostly in terms of the frictional force being zero, half, or twice the pushing force of 60 N.

(b) Most students were able to correctly calculate the numerical answer, but many were unsure of the appropriate unit, with many students incorrectly giving newton as their response.

Question 4 *(Low Demand)*

(a) (i) Just over two-thirds of students scored this mark.

(a) (ii) Under half of students scored this mark. Incorrect responses were mostly concerned with the efficiency of the apparatus provided, rather than correctly noting that the premier factors were either the relative positions of the LDR and torch or aspects of the surrounding environment where the investigation was undertaken.

(b) Most students stated the correct relationship between the intensity of the light and the resistance of the LDR to score one mark. However, few achieved the second mark by indicating the numerical decrease of the resistance within the range of light intensity values given in the question.

(c) (i) Few students correctly stated why a line graph was an inappropriate way of displaying the results. Most responses were couched in terms of the lack of results or the range of resistance value.

(c) (ii) Nearly half of the students correctly agreed that the student's data complimented those values taken from the manufacturer's graph. The reasons for students choosing to disagree were varied and, apart from misinterpreting the data, followed no clear pattern.

(d) Over three-quarters of students identified the correct circuit.

Question 5 *(Low Demand)*

(a) (i) Although two-thirds of students scored this mark, it is perhaps surprising that more did not know that the two-core cable does not include an earth wire.

(a) (ii) Nearly two-thirds of students understood that the lamp was double insulated. The most popular incorrect answer was 'totally' insulated.

(b) This question was not answered well with few students scoring the maximum three marks available. Many incorrect responses assumed that a fuse contributed to the protection of the wiring of a circuit inside a building by providing some kind of enhancement to the electrical insulation of a cable, or improvement to the physical fixing of wires inside a socket. There was also the erroneous assumption that the thin wire of a fuse mechanically snaps rather than overheats and melts.

Question 6 *(Low Demand)*

(a) (i) Nearly half of students scored both marks. Most of the remaining students achieved one mark.

(a) (ii) Just fewer than half of students correctly calculated that four X-rays just exceeded the yearly average radiation dose from the table. The most common error was to use the total average radiation dose received each year and produce a response of twenty five.

(b) (i) Most students were able to identify correctly the relationship between the risk of getting cancer and the radiation dose levels.

(b) (ii) About two-thirds of students identified graph C as the one which identified the effect of radiation hormesis, but only half of those students gave a correct reason for their choice. Many responses were not comparative regarding the reduced risk of cancer that zero exposure to radiation achieved and an exposure to low radiation doses.

(c) (i) Although a majority of the students realised that the experimental evidence supported the effect known as radiation hormesis, the explanations given were often too vague to achieve credit.

(c) (ii) Just over half of students identified the issue as being 'ethical'.

Question 7 *(Standard Demand)*

(a) (i) This was poorly answered with only just over a tenth of students scoring the mark. The most popular incorrect answer was to give points A and C, the total length of the extended spring.

(a) (ii) Again this was very disappointing, only a fifth of students could give the correct form of energy stored in the spring.

(b) (i) There were very few correct answers to this question. The majority of the students seemed concerned that a couple of the points were not exactly on the line or that the straight line suddenly curved upward.

(b) (ii) Just over a quarter of students were able to place the letter P in the correct position on the graph line, of these students only half could give a correct reason for their choice. Most incorrect responses showed placement of the letter at either the last point recorded by the student, or at a point where the graph line reached the top of the grid of the graph paper.

(c) A tiny proportion of students scored both marks in this question. However, about three-quarters were able to obtain a single mark. Unfortunately, the vast majority of the students failed to notice that the unit for the spring constant in the stem of the question was in newtons per metre, and simply multiplied the spring constant by the extension which was in millimetres. When calculated correctly, these students and those who made errors in their unit conversion, were able to score one mark.

Question 8 *(Standard Demand)*

(a) Most students achieved two marks by calculating the correct numerical value. Less than a fifth of students scored the third mark by stating the correct unit; the most common error was to state that the weight was measured in kilograms.

(b) This was the Quality of Written Communication (QWC) question on the paper which required the students to demonstrate their ability to use good English, organise their information clearly and use specialist terms where appropriate. Many students were able to supply some basic information as physics points, but often their responses lacked either the structure and organisation or the logical sequencing to achieve Level 2 and score three or four marks.

(c) (i) This question was answered well. The main errors were the height at which the parachute was dropped (which was in the stem of the question,) or to state the dependent variable.

(c) (ii) Of the three parachutes illustrated, the correct choice of parachute C was made by the vast majority of students, but there was less success in giving the reason in terms of a comparison of the relative surface areas and relative rates of descent.

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