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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Physics

PHA6/B6/T Investigative and Practical Skills in A2 Physics

Report on the Examination

2010 examination - June series

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GCE Physics, PHA6/B6/T, Investigative and Practical Skills in A2 Physics

General Points

In both ISA tests candidates were able to follow instructions on the task sheet and successfully take appropriate results. Feedback from centres suggested that the experiments worked well and no specific problems were reported.

In samples remarked by moderators both ISA P and ISA Q were present in approximately equal numbers as candidates' 'best mark', suggesting equivalence in standard of the two A2 ISAs.

Administration Procedures

The vast majority of centres followed administration procedures efficiently, and ensured that sample scripts and Centre Mark Forms arrived at the moderator by the prescribed deadline. There were problems with a few centres, with scripts arriving well beyond the deadline and Centre Declaration Forms and Candidate Record Forms missing or unsigned.

Marking

A tolerance of ± 3 is allowed on the ISA test before centre marks are adjusted. The majority of centres marked the scripts accurately in accordance with the marking guidelines. Most centres were within the allowed tolerance, and only a small number of centres had marks adjusted. It should be noted that just one script out of tolerance in the preliminary sample remarked by moderators will automatically mean that further samples will be remarked and an adjustment to all the centre marks is then likely.

There are still problems with some centres particularly with respect to graphs. Marks were awarded for unsuitable scales, incorrectly plotted points and inappropriate lines of best fit.

Advice is available from the Teacher Resource Bank on the AQA website and from the allocated Assessment Advisers. Further details of marking errors in specific questions are mentioned later in the detailed report on each ISA.

PSA

As expected, most middle and higher grade candidates achieved full marks (nine) on this component. Less able candidates typically did not gain one or two marks out of the nine available.

ISA P – Simple Harmonic Motion

Stage 1

Most candidates scored well on this section with a large proportion achieving seven or eight marks.

Virtually all candidates were able to perform the experiment and take appropriate readings to determine time period, *T*, for a range of values of *d*. A change in *d* of 10 cm produces only a very small change in the corresponding time period, *T.* Consequently, good experimental technique in timing the oscillation was required in order to produce a smooth curve on the graph. Tabulation was generally very good.

Marks lost were usually due to significant figures on distance *d*, quoted to nearest cm rather than mm (marking point 'b'), significant figures on time period sometimes unrealistically quoted to the nearest ms (marking point 'e') and inappropriate scales on graph y-axis (marking point 'h').

Section A

Question 1

Part (a) was answered correctly by all but the least able candidates.

Most candidates could state the best position of the fiducial marker in the centre of the oscillation in part (b), but the explanation proved more difficult. Acceptable alternatives are given in the mark scheme.

Timing multiple oscillations was the most popular choice for many candidates in part (c), but again explaining why proved more difficult. Many candidates incorrectly stated that this reduces the uncertainty in timing, rather than correctly pointing out that it is the percentage uncertainty in timing which is reduced.

In part (d) (i), only the more able candidates were able to cope with the algebra by correctly squaring T^2 and substituting for L^2.

Part (d) (ii) was answered correctly by more the able candidates. The most common error was to refer to s^2 instead of d^2. This is clearly incorrect since *s* is a constant in this arrangement.

Many candidates found part (d) (iii) difficult. Use of either the gradient or intercept was acceptable.

Section B

Question 2

Part (a) was accessible for most candidates. Having correctly spotted a miscount in the number of oscillations timed, most candidates sensibly suggested repeating the anomalous result. No credit was awarded for stating 'human error in timing'.

Although parts (b), (c) and (d) involved logs, tabulation was correctly completed by almost all candidates. The most common error in determination of the gradient was to omit the negative sign on the gradient. This point was also overlooked by some markers.

Part (e) was more discriminating with only the more able candidates recognising that the gradient gives the power of *d* in the equation, and has an integral value of –1.

Question 3

Part (a) was accessible to most candidates, although a significant proportion missed the unit.

Part (b) (i) and (ii) provided straight forward uncertainty calculations, but a significant proportion of candidates did not score more than one out of the three marks available.

Only the most able candidates correctly combining the percentage errors and converting to a final ± uncertainty value for *k* in part (b) (iii).

Question 4

A significant number of candidates did not recognise that the recorded time of 0.51 s represented only half an oscillation in part (a), and had to be doubled to give the time period.

In part (b), many candidates simply assumed the electronic method was better, and tried to justify this from the data provided. The question discriminated well, and higher grade candidates were able to successfully estimate the uncertainty for the electronic method (± 2%) and compare this with the uncertainty hand operated timer (± 0.9%) using data from the table or question 3 (b) (i).

For part (c), many candidates correctly suggested timing multiple oscillations but found it difficult to give an acceptable explanation in terms reduction of the percentage uncertainty in timing.

ISA Q – Absorption of Light/Inverse Square Law

Stage 1

A number of centres reported that their apparatus gave a linear relationship between *R* and *n*. In such cases, a straight line graph can be credited for marking point 'h'.

Almost all candidates were successfully able to perform the experiment and take an appropriate set of results. A large proportion of candidates achieved seven or eight marks on this section.

Section A

Question 1

Part (a) provided an easy mark for most candidates.

In part (b), for a curved graph, candidates had to explain that *R* increases with *n* **and** the increase is non linear. Marks were not awarded for any reference to the curve being exponential.

Most students referred to using a micrometer screwgauge in part (c), but did not necessarily gain the second mark by suggesting measuring the thickness of a pile of sheets of the paper.

Less able candidates found part (d) difficult, often unsure of the purpose of the graph.

Part (e) (i) was correctly answered by a large proportion of candidates. Wavelength was the most common incorrect response.

Part (e) (ii) discriminated well, with more able candidates stating that the resistance of the LDR should be measured with each filter in turn and that the resistance will vary if the LDR is colour sensitive.

'The one that transmits most light' was not allowed in part (e) (iii). The correct answer should refer to the colour filter with the lowest resistance.

Section B

Question 2

Part (a) was an easy question, with most candidates referring to background radiation.

Many candidates found part (b) difficult. 'Identifying anomalies' was an acceptable answer that was not included in the mark scheme.

Part (c) should be calculated from 0.5 × range of repeat readings.

More able candidates realised that for part (d), the uncertainty in $1/d^2$ is the same as the uncertainty in d^2, and this is double the uncertainty in d.

Part (e) was a straightforward question for most candidates. Four significant figures were allowed on the value of $1/\sqrt{C}$, since this gave data of comparable uncertainty to other values in this column.

Question 3

Part (a) was a straightforward question for most candidates, although some lines of best fit drawn were unacceptable.

A significant proportion of candidates did not gain credit in part (b) (i) because their line was poor and the gradient was out of the allowed tolerance.

Part (b) (ii) involves understanding that k is the gradient of the graph. The answer must be to two or three significant figures. A significant proportion of candidates were unable to state the correct unit.

Question 4

Most candidates correctly stated systematic error in part (a). A significant proportion referred to zero error, which is incorrect in this context, a 'zero error' is a systematic error in a measuring instrument.

Part (b) was more obvious if the line on the graph is extrapolated to the x-axis.

Part (c) could either be answered directly from the intercept on the x-axis or by calculation from the intercept on the y-axis.

Question 5

This question discriminated well, with only the higher grade candidates scoring any marks. Simply stating 'yes, because the graph is a straight line' was not enough.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results statistics page of the AQA Website.