Course Report 2018

Subject	Physics
Level	Higher

This report provides information on the performance of candidates. Teachers, lecturers and assessors may find it useful when preparing candidates for future assessment. The report is intended to be constructive and informative and to promote better understanding. It would be helpful to read this report in conjunction with the published assessment documents and marking instructions.

The statistics used in this report have been compiled before the completion of any Post Results Services.

Section 1: comments on the assessment

Summary of the course assessment

Component 1: question paper

The multiple-choice section of the paper performed as expected and no adjustments were made to grade boundaries for this part of the assessment.

In the written section of the question paper, five parts of questions did not perform as anticipated. Questions 1(b), 2(b), 3(c), 8(b) and 9(b)(iii) were all more demanding than expected and the grade boundaries were adjusted to take these questions into account.

Component 2: assignment

This part of the assessment performed in line with expectations. There were no changes to either the assessment or the marking instructions. No adjustments were made to grade boundaries for this part of the assessment.

Section 2: comments on candidate performance

Areas in which candidates performed well

Component 1: question paper

Candidates did well in sections of the question paper that require them to carry out calculations. Most candidates coped well when using an equation that they had not seen before and most could accurately plot a graph from data provided. Candidates did well in the following questions:

Question 1(a)(i)	Determining the components of a vector.
Question 2 (a)(ii)	Calculating the power of the motor.
Question 4	The first open-ended question was well attempted by most candidates.
Question 7(c)	Many candidates correctly identified that the threshold frequency would be lower and that the line would be parallel.
Question 9(b)(ii)	Calculating the critical angle of a substance.
Question 10(b)	Determining the frequency of an emitted photon.
Question 10(c)	Determining the recessional velocity of the distant galaxy.
Question 12(a)(i)(ii)	Interpreting a CRO trace.

Component 2: assignment

Candidates who follow the ‘Instructions for candidates’ section of the coursework assessment task manage to access the majority of available marks.

Most candidates seem to have grasped the importance of writing an aim that is investigable and can be answered by their conclusion.

Areas which candidates found demanding

Component 1: question paper

Question 3(b)	Many candidates could not apply an appropriate sign convention.
Question 3(c)	Many candidates were imprecise in their responses and missed out key words such as 'total' and 'kinetic'.
Question 5(b)(i)	Many candidates did not convert their answer from seconds into years, as required in the stem of the question. They simply calculated the answer in seconds and then wrote the unit as years.
Question 5(c)	Many candidates answered 'dark matter' rather than 'dark energy'.
Question 6(c)	Many candidates made a reasonable attempt at answering the second open-ended question, and nearly all made reference to the model. However, a number of candidates commented on fusion reactors rather than particle accelerators.
Question 7(b)(i)	Many candidates' responses lacked precision.
Question 7(d)	Many candidates could not provide an explanation of why the photoelectric effect provides evidence for the particle nature of light.
Question 8(a)(iii)	Candidates could not state the effect of changing the grating on the interference pattern produced nor could they justify this change. It was apparent that many candidates were unfamiliar with the experiment.
Question 8(a)(iv)	Candidates could not provide the correct definition of coherence. This issue has been highlighted in previous course reports.
Question 9(b)(iii)	Despite being led through the question and being asked to calculate the critical angle, many candidates did not realise that the light would undergo total internal reflection at the right-hand side of the prism.
Question 10(a)	Candidates could not state the features of the Bohr model of the atom. In many cases, they confused the Rutherford model with the Bohr model.
Question 11(b)	Some candidates failed to take account of the unit prefixes on each axis.
Question 11(c)	Very few candidates could supply an explanation of the operation of LEDs in terms of band theory. This is despite many candidates supplying good descriptions of exactly the same concepts in their assignment reports.
Question 12(a)(iii)	Many candidates could not state that LEDs only operate when they are forward biased. Again, this is something that large numbers of candidates stated in their assignment reports.

Component 2: assignment

There was a slight drop in candidate performance in this year's assignment compared to last year. This was an overall drop in performance and not in one particular section.

Candidates are still having difficulty carrying out an appropriate treatment of uncertainties from their experimental data. Centres should ensure that candidates understand that they must provide reading uncertainties for all of their experimental measurements and that they should be calculating random uncertainties for repeated measurements.

In the evaluation section, candidates often did not supply a justification for their evaluation. For example, candidates should make it clear that they have considered why a source is reliable, or why a suggested experimental change would produce an improvement in their data.

There was still evidence of candidates being directed to an inappropriate choice of assignment topic, where the physics involved was clearly beyond the level of understanding of the candidates, or the choice of topic/aim did not allow candidates to access all the marks. For example, refractive index by real and apparent depth or parallax; coefficients of friction; Cepheid variables, some of which may be part of Advanced Higher projects.

Section 3: advice for the preparation of future candidates

Component 1: question paper

Centres should ensure that candidates know and understand the basic physics definitions required for the Higher course.

Centres should encourage candidates to read carefully both the question and associated data.

Centres should ensure that candidates are aware that they should start a ‘show’ question by stating an appropriate relationship, showing the substitution and stating the required answer. Candidates should be encouraged to be careful and consistent when applying a sign convention during calculations, for example in momentum or impulse calculations.

Candidates should be encouraged to use technical physics terms when answering questions.

Centres should ensure that candidates have experience of manipulating experimental data.

Centres are also encouraged to allow candidates to take an active part in a wide range of practical work. There was some evidence in the answers to questions, such as 8, 9 and 11, that where candidates had experience of carrying out a wide range of practical work they could cope well with this type of question. Whereas, other candidates struggled to answer any questions related to practical work, suggesting that they were unfamiliar with experimental work at Higher level.

Candidates should be made aware that the gradient of a line should be calculated using values from the line and not data points provided, which may not be on the line of best fit.

In calculations, some candidates were unable to provide a final answer with the appropriate number of significant figures (or to round these correctly). It was evident that some candidates confuse significant figures with decimal places. Centres should ensure that candidates understand and can use significant figures appropriately.

Candidates should be strongly discouraged from copying down answers from their calculator containing a large number of significant figures, or using ellipses, as a penultimate stage in their response before stating their final answer, as often this can introduce transcription or rounding errors into their calculations. They should be strongly encouraged to show only the selected relationship, the substitution and then the answer, including units, to the appropriate number of significant figures.

Component 2: assignment

The criteria to be used in session 2018–19 has been updated. Teachers and lecturers must familiarise themselves with the new specification and consider the material on the understanding standards website when it becomes available. Centres are encouraged to send a representative to one of the Understanding Standards events in the autumn, before allowing candidates to undertake their assignments.

Candidates appear to be using the material available on the understanding standards website. Centres are again encouraged to use their judgement when using this material as under no circumstances should candidates copy the material.

It is important to note that there should be some element of candidate choice in the topic chosen for the assignment and not simply that all candidates in a centre are given the same topic/aim to investigate by the teacher or lecturer. The range of choice will depend upon a number of factors, such as availability of appropriate apparatus.

Centres should ensure that candidates are fully prepared before beginning the assignment.

Candidates should be encouraged to choose topics that are appropriate to the level, and contain practical work that produces sufficient data, and underlying physics commensurate with Higher level.

Centres are reminded that the practical work for the assignment must be carried out individually or in small groups of no more than four.

Centres should ensure that candidates have access to the 'Instructions for candidates' section of the coursework assessment task, which must not be altered, during the communication phase of the assignment.

Candidates should ensure that their data is sufficient to draw a conclusion that relates to the aim.

Centres should ensure candidates have a full understanding of uncertainties before they attempt their assignments.

When drawing graphs, candidates should be encouraged to clearly mark the position of their data points. If using Excel or other graphing packages, candidates need to ensure that they include both minor and major gridlines, the data points are not too large, and the graph is of an appropriate size.

Whilst it was pleasing to see that the conditions of assessment for coursework were adhered to in the majority of centres, there were a small number of examples where this may not have been the case. Following feedback from teachers, we have strengthened the conditions of assessment criteria for National 5 and Higher and will do so for Advanced Higher. The criteria are published clearly on the SQA website and in course materials and must be adhered to. SQA takes very seriously its obligation to ensure fairness and equity for all candidates in all qualifications through consistent application of assessment conditions and investigates all cases where conditions may not have been met.

Grade boundary and statistical information:

Statistical information: update on courses

Number of resulted entries in 2017	8955

Number of resulted entries in 2018	8280

Statistical information: performance of candidates

Distribution of course awards including grade boundaries

Distribution of course awards	Percentage	Cumulative %	Number of candidates	Lowest mark
Maximum mark				
A	28.0%	28.0%	2320	79
B	24.5%	52.6%	2032	67
C	23.2%	75.7%	1919	55
D	8.7%	84.4%	717	49
No award	15.6%	-	1292	-

General commentary on grade boundaries

SQA's main aim is to be fair to candidates across all subjects and all levels and maintain comparable standards across the years, even as arrangements evolve and change.

SQA aims to set examinations and create marking instructions which allow a competent candidate to score a minimum of 50% of the available marks (the notional C boundary) and a well prepared, very competent candidate to score at least 70% of the available marks (the notional A boundary).

It is very challenging to get the standard on target every year, in every subject at every level.

Therefore, SQA holds a grade boundary meeting every year for each subject at each level to bring together all the information available (statistical and judgemental). The Principal Assessor and SQA Qualifications Manager meet with the relevant SQA Business Manager and Statistician to discuss the evidence and make decisions. The meetings are chaired by members of the management team at SQA.

- The grade boundaries can be adjusted downwards if there is evidence that the exam is more challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- The grade boundaries can be adjusted upwards if there is evidence that the exam is less challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- Where standards are comparable to previous years, similar grade boundaries are maintained.

Grade boundaries from exam papers in the same subject at the same level tend to be marginally different year to year. This is because the particular questions, and the mix of questions, are different. This is also the case for exams set by centres. If SQA alters a boundary, this does not mean that centres should necessarily alter their boundary in the corresponding practise exam paper.