External Assessment Report 2015

Subject(s)	Physics
Level(s)	Intermediate 2

The statistics used in this report are prior to the outcome of any Post Results Services requests

This report provides information on the performance of candidates which it is hoped will be useful to teachers/lecturers in their preparation of candidates for future examinations. It 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 question papers and marking instructions for the examination.

Comments on candidate performance

General comments

Feedback from markers, teachers and examinees considered the examination as a fair and well balanced assessment. The standard of the paper was deemed to be a suitable combination of challenging and straightforward questions. In addition to numerical and descriptive questions, candidates were also required to use information from two graphs for mathematical processing. The completion of a light ray diagram was also tested.

Questions were set in varying contexts which assessed fundamental principles and learning outcomes within the Arrangements for Intermediate 2 Physics. Integration featured widely in appropriate contexts. There was little evidence of poorer performance in any one area, which indicated very good preparation of candidates by presenting centres.

Questions requiring candidates to perform calculations were generally answered well, and equations were transposed accurately for the most part, however, there were many who substituted incorrect data as detailed later in specific questions. There were many instances of candidates failing to convert units and ignoring prefixes. Many candidates are also still underperforming in questions requiring definitions, explanations and descriptions. This was mainly due to imprecise and careless responses.

The paper was accessible to all candidates, and there was no evidence of a lack of time.

Areas in which candidates performed well

In general, the multiple choice questions were answered very well with candidates achieving an average test score of 14.5. The following multiple-choice questions had very high facility values: 7, 9, 12, 13, 15, 16, 19 and 20. These covered the conversion of potential energy to kinetic energy, electrical circuits, a resistance calculation, electromagnetic induction, the law of reflection, atomic structure and the equivalent dose. Candidates required an understanding of basic knowledge and skills in problem solving.

In the written part of the paper, candidates responded very well, achieving an average mark of 72%. Responses to the following questions were particularly good:

- Question 21(a)(i): The calculation of acceleration using $v = u + at$ from a graph.
- Question 21(a)(ii): The definition of a vector.
- Question 23 (c): The calculation of kinetic energy.
- Question 24: This question was well answered in all parts which involved knowledge of conductors and insulators and calculations of electrical charge and the wavelength of radio waves.
- Question 25(a): Candidates needed to draw a circuit diagram using images of electrical components.
- Question 25(b): The calculation of resistance using $V = IR$.
- Question 26(b and c): These involved the calculation of input voltage to a transformer, and the input power and efficiency of a motor.

- Question 29 (b)(iii): The calculation of the focal length of a lens using $P = \frac{1}{f}$
- Question 30(a): The effect of increasing the thickness of a material on the absorption of radiation.
- Question 30(c): The determination of the half-life of a radioactive substance using a graph.

Areas which candidates found demanding

In the multiple-choice section, Questions 3, 5, 8, 11, 14 and 17 were less well answered than the other questions. These covered calculations involving a projectile, knowledge of the unit of work, the knowledge and understanding of voltage, voltage in a voltage divider circuit, the electromagnetic spectrum and the critical angle.

In the written part of the paper, responses to the following questions posed particular difficulties for candidates:

- Question 22 (a)(ii): Candidates found it difficult to calculate the resultant force.
- Question 23 (a): This question required the correct definition of the conservation of momentum.
- Question 25 (c): Few candidates understood the distribution of current in an electrical circuit.
- Question 27 (c): Candidates had difficulty in explaining the operation of the transistor circuit. This is a standard question which occurs frequently.
- Question 28 (b): Knowledge of the effect of increasing the speed of ultrasound on the wavelength of the waves was poorly understood.
- Question 29 (a): Copying and completing the ray diagram was poorly done.
- Question 29 (b)(i): Very few could give a correct definition for refraction.
- Question 30(b)(i): There was a lot of confusion in identifying and explaining which radioactive source should be used in the monitoring of paper thickness.

Advice to centres for preparation of future candidates

- Ensure that candidates know and understand the appropriate definitions and explanations given in the content statements.

- Ensure that candidates know and understand how and when to use appropriate formulae with correct symbols.

- Encourage the candidates to read the questions thoroughly, note the information carefully and select the appropriate information.

- Provide time for candidates to draw electrical symbols and circuits, vector diagrams, ray diagrams and graphs.

- Candidates should also familiarise themselves with the quantities listed in the data sheet at the beginning of the paper. This would hopefully reduce common confusion in quoting the speeds of sound and light, and the specific latent heats of vaporisation and fusion.

- Provide time for candidates to draw vector diagrams, ray diagrams and graphs. Remind candidates of the rationale for drawing graphs and the significance of the shape of the line and the information which can be obtained from the graph eg the area under a speed time graph is equal to the distance which the object has travelled.

- As in previous years, candidates tend to provide careless and minimal responses in the 'describe and explain' questions. More opportunities could be given in class for candidates to demonstrate understanding of basic concepts. Remind candidates that they must give full and accurate solutions, especially in answers where two marks are awarded. A standard '2 mark answer' requires a formula (1/2), correct substitution (1/2) and a numerical answer with the correct unit (1). Naturally, a candidate will achieve full marks by supplying the correct answer but is at risk of losing a lot of marks if the full solution is not supplied and an arithmetic error has occurred. Answers must also be clear and legible. Centres are reminded that the CfE Physics qualifications do not use ½ marks and the 'standard two marker' is now a 'standard three marker'.

- Candidates should practise using all the prefixes listed in the content statements for the Int 2 Course, and be able to enter them into their calculators correctly. Also, they should not attempt any unnecessary conversions, eg kilograms into grams. Many forgot to convert km into metres.

- Remind candidates to include units in the final answers, and encourage them to check that they are the correct units. Weight is still often answered in kg.

- Attention must be also given to the inappropriate rounding of numerical answers and the use of significant figures. Some candidates are still quoting answers to too many significant figures or are confusing significant figures with decimal places.

Statistical information: update on Courses

Number of resulted entries in 2014	3680

Number of resulted entries in 2015	352

Statistical information: Performance of candidates

Distribution of Course awards including grade boundaries

Distribution of Course awards	%	Cum. %	Number of candidates	Lowest mark
Maximum Mark - 100				
A	54.5%	54.5%	192	70
B	18.2%	72.7%	64	60
C	13.4%	86.1%	47	50
D	4.3%	90.3%	15	45
No award	9.7%	-	34	-

For this Course, the intention was to set an assessment with grade boundaries at the notional values of 50% for a Grade C and 70% for a Grade A. The Course assessment functioned as intended, therefore no adjustment to grade boundaries was required.

General commentary on grade boundaries

- While SQA aims to set examinations and create marking instructions which will 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.

- Each year, SQA therefore holds a grade boundary meeting for each subject at each level where it brings 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.

- An exam paper at a particular level in a subject in one year tends to have a marginally different set of grade boundaries from exam papers in that subject at that level in other years. This is because the particular questions, and the mix of questions, are different. This is also the case for exams set in centres. If SQA has already altered a boundary in a particular year in, say, Higher Chemistry, this does not mean that centres should necessarily alter boundaries in their prelim exam in Higher Chemistry. The two are not that closely related, as they do not contain identical questions.

- 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.