External Assessment Report 2012

Subject(s)	**Physics**
Level(s)	**Intermediate 2**

The statistics used in this report are pre-appeal.

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

The examination was considered to be a fair and well balanced assessment. Markers, teachers and candidates regarded the exam as challenging but of an appropriate standard.

In addition to numerical and descriptive questions, candidates were also required to complete light ray diagrams (which were of mixed quality). Questions were set in various scenarios which tested 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 good preparation of candidates by presenting centres.

Questions requiring candidates to perform calculations were answered well, and equations were transposed accurately for the most part. However, there were many who substituted incorrect data. 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.

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

Areas in which candidates performed well

Responses to the paper were, for the most part, good.

In general, the multiple-choice questions were answered well with candidates achieving an average test score of 12.7. The following multiple-choice questions had very high facility values: Question 1 (scalars and vectors), Question 4 ($F = ma$), Question 12 (input and output devices), Question 13 (electrical conduction), Question 14 ($Q = It$) and Question 19 (radiation absorption). These involved an understanding of basic knowledge and ability to problem solve.

In the written part of the paper, responses to the following questions were particularly good with over 85% of candidates giving correct answers:

Question 21 (a): The calculation of the distance travelled by the satellite was done well.

Question 21 (c) (ii) and (iii): These questions about gravitational field strength and weight generated good responses.

Question 22 (b): A calculation of kinetic energy.

Question 23 (a) (i): A calculation of potential energy.

Question 26 (d): Whilst this calculation was answered correctly by most candidates, some substituted $V = 12$ (voltage) into $v = f \times \lambda$, instead of 3×10^8 m/s. Similar mistakes have been evident in previous papers, indicating that candidates should be more selective in using appropriate information.

Question 28: This question on light and sight was generally good with part (d) (i) on sight correction done particularly well.

Areas which candidates found demanding

In the multiple-choice section, Questions 2, 10, 15, and 17 were poorly done. These covered unbalanced forces, transformers, a.c and d.c. and critical angle. Candidates found it difficult to select the appropriate information to answer the questions correctly. In Question 10, about transformers, the most common option selected indicated that candidates had failed to notice that the transformer was connected to a 10 V d.c. supply and its output would be 0 V.

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

Question 21: This was a straightforward introductory mechanics question involving distance, time and weight calculations, which were done well. However, there were poor responses to parts (a) (ii) and (c) (i). These required an explanation of acceleration and definition of gravitational field strength which are both standard outcomes and have been asked frequently in past papers.

Question 22 (b) and(c): Whilst most candidates calculated kinetic energy correctly, many failed to realise the equivalence between kinetic energy and work done.

Question 23 (a) (iii): Many candidates stated that the actual temperature would be less but did not give a full explanation, ie they simply wrote ‘heat was lost’ without qualifying where or how.

Question 23 (b): Many candidates confused the melting point of copper with the latent heat of fusion.

Question 24 (a): Few candidates were able to draw the correct symbol for a battery.

Question 24 (c): Explanations as to why the resistor overheated were incomplete and many candidates failed to realise the answer required an electrical power calculation.

Question 24 (d): Many candidates did not understand the effects of connecting resistors in parallel circuits.

Question 25 (c) and (d): These questions involved voltage dividers, resistance and voltage calculations and an understanding of the operation of the circuit. Many candidates wrote about resistance increasing but failed to be specific in their explanations and should have mentioned that the resistance of R_T increased.

Question 26: This was a long and challenging question but generally done well. However, part (b) was poorly done — where candidates had to explain electromagnetic attraction. In part (c), many did not use the correct voltage (3 V) to calculate the value of resistance *R*.

Question 28 (b): Again another explanation which was not well answered, requiring an understanding of the significance of curved reflectors.

Question 28 (c): Many candidates failed to convert mV correctly and also included units for gain.

Question 29 (b) and (c): Candidates did not give enough detail in stating factors affecting background radiation level. Many could not state what is meant by a gamma ray — most described what it does.

Question 30(b) (ii): Many candidates did not understand the purpose of the containment vessel.

Advice to centres for preparation of future candidates

General

Ensure that candidates know and understand the appropriate definitions and concepts as 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 circuits, vector diagrams, ray diagrams and graphs.

As in previous years, candidates tended 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. Several candidates were disadvantaged because their writing was totally illegible.

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 and minutes into seconds.

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 too many significant figures.

Statistical information: update on Courses

Intermediate 2

Number of resulted entries in 2011	4,083

Number of resulted entries in 2012	4,369

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	33.6%	33.6%	1,467	69
B	21.7%	55.2%	946	59
C	18.7%	74.0%	819	50
D	8.6%	82.6%	377	45
No award	17.4%	100.0%	760	-

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.