External Assessment Report 2014

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

The examination was widely recognised by markers, teachers and candidates, as a fair and balanced assessment. The standard of the paper was deemed to be a suitable combination of challenging and straight-forward questions. In addition to answering numerical and descriptive questions, candidates were also required to use information from a graph for mathematical processing. Completion of a light ray diagram and the construction of a circuit diagram were also tested.

Questions were set in some interesting and contemporary contexts which assessed fundamental principles and learning outcomes within the Arrangements for Intermediate 2 Physics. The paper combined a good mix of numerical and descriptive questions, and integration featured widely. 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, candidates are 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

In general, the multiple-choice questions were answered well. The following multiple-choice questions had very high facility values:

1: Knowledge of vector quantities.

4: Using a vector diagram to identify a resultant force.

7: The calculation of charge from $Q = It$. This was well done given the facts that there was unnecessary information in the stem of the question and candidates had to convert minutes into seconds.

8: The identification of electrical components from their symbols.

14: The identification of the wavelength and amplitude of a wave from a wave diagram.

20: The identification of the radioactive hazard sign.

In the written part of the paper, responses to the following questions were particularly good:

21(a)(i): The calculation of acceleration from a speed/time graph.

21(a)(ii): The interpretation of the graph's shape to explain the motion of the boat.

21(b)(i): The calculation of distance travelled from the area under a speed/time graph.

21(b)(ii): An average speed calculation.

23(c): A specific heat calculation.

24(b)(i): The calculation of resistance from a graph of voltage against current.

24(c)(ii): The calculation of the frequency of light from $v = f\lambda$.

24(c)(iii): The knowledge of an output device.

25(a)(i): The calculation of power gain of an amplifier.

26(b)(i): The symbol for a MOSFET.

27(a)(i): Knowledge of total internal reflection.

27(b)(i): The calculation of the wavelength of microwaves using $v = f\lambda$.

28(a): The calculation of the focal length of a lens using $P = 1/f$.

29(a)(i): The calculation of the absorbed dose.

29(a)(ii): The calculation of the equivalent dose.

30(b): the calculation of power produced using $P = E/t$.

Areas which candidates found demanding

The following questions in the multiple-choice section were poorly answered:

10: Many candidates could not determine what the effect of increasing resistance in a series circuit would be on the current and voltage.

11: Candidates did not realise that the ammeter readings in a series circuit should be the same.

16: Light reflection from a mirror — most candidates knew that the angle of incidence equals the angle of reflection. However, they failed to realise that the angles should be measured to the normal.

19: Biological harm from radiation exposure — most candidates thought that the activity of the source contributed to the risk.

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

21(a)(iii): Many candidates did not draw and label the horizontal forces acting on the boat correctly.

22(b): Many candidates did not substitute the quantities correctly into $v = u + at$. Many confused the initial speed with the final speed.

23(a): Despite the identification of 'Newton's pairs' being mentioned in the content statements (1.3.2), very few candidates identified the pair of forces involved in the motion of the spacecraft.

25(d)(ii): Candidates did not explain what is meant by alternating current correctly.

25(d)(iii): The induction of an a.c.voltage by the guitar string was not explained properly.

26(a)(i): As in previous years, candidates find it difficult to calculate resistance in a voltage divider circuit.

26(b)(ii): The explanation of the operation of a transistor operated switching circuit was very poorly attempted.

26(b)(iii): Candidates did not understand the effect of increasing the resistance of the variable resistor on the temperature at which the circuit is switched on.

27(b)(ii): Candidates did not realise that all mobile phones use waves from the electromagnetic spectrum which travel at the same speed so that signals will take the same time.

28(b): As in previous years, ray diagrams were not completed accurately and many candidates failed to label the image.

29(b): The effect of radiation exposure on photographic film was not answered correctly.

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. Remind candidates of the rationale for drawing graphs and the significance of the shape of the line, and the information that can be obtained from the

graph, eg the area under a speed-time graph is equal to the distance the object has travelled.

- 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.

- 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 (½), correct substitution (½), 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 Intermediate 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 too many significant figures.

Statistical information: update on Courses

Number of resulted entries in 2013	4873

Number of resulted entries in 2014	3680

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	37.4%	37.4%	1375	70
B	19.1%	56.5%	703	60
C	16.7%	73.2%	614	50
D	7.2%	80.4%	266	45
No award	19.6%	-	722	-

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.