Principal Assessor Report 2002

Assessment Panel:	**Physics**

Qualification area

Subject(s) and Level(s) included in this report	**Physics – Higher**

Statistical information: update

Number of entries in 2001	
Pre appeal	9875
Post appeal	10060

Number of entries in 2002	
Pre appeal	9577
Post appeal	Not available

General comments re entry numbers

There has been a decrease of 298 (3.0%) candidates at pre- appeal stage. This could have been caused by an increase in the number of candidates at Intermediate 2. Further evidence for this is that while there is still a tail in the distribution of marks it is not as marked as in 2001.

General comments

The overall performance was very good but not as good as in 2001. Markers reported that the candidate performance was between that of 2000 and 2001.

Grade boundaries at C, B and A for each subject area included in the report

Pass mark stage			
	Lowest Mark out of 90		
Year	*Lowest A*	*B*	*C*
2002	66 (73%)	55 (61%)	44 (49%)

General commentary on grade boundaries

Notional percentage cut-offs for each grade

Question papers and their associated marking schemes are designed to be of the required standard and to meet the assessment specification for the subject/level concerned.
For National courses the examination paper(s) are set in order that a score of approximately 50% of the total marks for all components merits a grade C (based on the grade descriptions for that grade), and similarly a score of 70 % for a grade A. The lowest mark for a grade B is set by the computer software as half way between the C and A grade boundaries.

Comments on grade boundaries for each subject area

The markers judged the Paper to be fair, with good coverage of the content; they did however consider it to be more difficult than in 2001. The mean mark for Section A was 0·5 marks higher than last year whereas the mean for Section B was down by 4·1 marks, giving a net drop of 3·6 marks. The proportion of candidates performing very poorly was less than in previous years. This would have tended to increase the average mark scored by candidates. The Paper this year gave greater differentiation of the candidates than in 2001; certain questions were particularly effective in ensuring differentiation. Overall there were 7 marks, which were inaccessible to many candidates. This may have had a greater effect on the higher performing candidates. In 2001, 10 candidates gain full marks and 97 candidates gained 88 marks or more out of the total of 90; this year only 2 candidates gained full marks and 20 candidates gained 88 marks or more.

The lowest mark for an A was therefore set at 66 marks (73%);

The lowest mark for a C was set at 44 marks (49%);

The grade boundaries for A, B and C at 73%, 61% and 49% are close to the nominal grade boundaries.

Comments on candidate performance

General comments

There was as usual a wide variation of ability of candidates. The distribution of marks was however narrower than last year and markers reported that there were fewer badly prepared candidates.

Many candidates continue to find questions that require a qualitative response to be the most difficult. Arithmetic skills were of a similar high standard to previous years. The quality of English was acceptable but many candidates did not use the technical language expected of a Higher candidate.

Candidates need more guidance on the significance of the language used in questions. In particular, Question 21(c) most candidates lost marks as they did not realise the requirement of *describing* differences between graphs and only *explained* differences in effects.

Areas of external assessment in which candidates performed well

Candidates were generally competent in the calculations of uncertainty in question 21(b).
Most candidates responded well to question 22, which was based on the Gas Laws. Some however did not change the temperature into kelvins. There has been an improvement from previous years in the explanations of the Gas Laws in terms of the kinetic model. Candidates are obviously receiving more guidance in this type of question. There were also excellent responses to the problem solving part (c) of this question based on an unusual application.
Most candidates demonstrated good knowledge of the calculations concerning the charge of a capacitor in question 25(a).
Many candidates gained high marks in question 30 on radioactivity and dosimetry. The structure and clarity of many of the other responses was however poor.

Areas of external assessment in which candidates had difficulty

Many candidates found it difficult to interpret the displacement-time graph of question 21.
Very few candidates made reference to the given graph and their predicted graph in order to describe the changes.
Correct use of signs/conventions with quantities in momentum and impulse equations in question 23 was again a problem. Many candidates gave an answer that had time negative and yet did not think to review their working.
Very few candidates gave a definition of e.m.f in terms of energy in question 24(a). Many candidates seemed to think that the voltmeter in the circuit of 24(c) would give the lost volts rather than the terminal potential difference. Similarly many explained wrongly that the reading on the voltmeter would decrease because $V=IR$ and the total resistance decreased (not realising that the current was not constant).
The predicted charge and discharge graphs of question 25(b) were poor; candidates who had the charging and discharging at the correct times often had the wrong shapes of curve.
In question 26(b)(ii)(A) a significant number of candidates plotted the output voltage against input voltage and a few plotted output voltage against feedback resistance. The marking scheme was altered to allow for this misinterpretation of the question.
There were very few good explanations of the term *critical angle*. Most candidates were unable to work out the passage of the light ray through the glass prism in question 27.
Candidates found the description in semiconductor physics very difficult. There seems to be significant confusion of the term *electron-hole pairs* with many candidates taking this to mean "electrons having joined up with holes".

Areas of common misunderstanding

Many candidates are unaware of the importance of using correct signs for vectors in the equations of motion and impulse questions.

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Recommendations

Feedback to centres

- Candidates must be made aware of the importance of the correct use of signs when using relationships involving vector quantities. A calculation that results in a time having a negative value should be reviewed.
- Candidates should be encouraged to present their calculations, such as those using conservation of momentum, in a way that clearly shows the steps in their reasoning.
- The importance of being able to give the definitions of quantities such as e.m.f and critical angle must be stressed.
- Candidates on average need practice in the type of questions that require descriptions and/or explanations.
- When using the kinetic model to describe the effect of increasing temperature on the pressure of a gas it is necessary to state that there will be "more collisions per second" rather than just the "number of collisions increases".
- The skill of calculating the path of a ray of light through a transparent prism with or without total internal reflection needs to be practised.
- Where a question requires a calculation in order to verify the value of a quantity the calculation must show all the steps in the calculation and the final value.
- Many candidates cannot state the basic Physics of semiconductor devices.
- Candidates should be encouraged to use appropriate technical language for a Higher Course e.g. "the molecules collide with a greater force on the walls" rather than " they collide more violently with the walls".