Principal Assessor Report 2002

Assessment Panel:	**Physics**
Qualification area	
Subject(s) and Level(s) included in this report	**Physics Advanced Higher**

Statistical information: update

Number of entries in 2001	
Pre appeal	1026
Post appeal	1026

Number of entries in 2002	
Pre appeal	1378
Post appeal	

General comments re entry numbers

Pleasing to see an increase in the number taking Physics at this level.

General comments

Last year's Higher candidates attained an exceptional number of A passes. This may indicate that the quality of this year's Advanced Higher cohort should be high.

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

Year	Lowest mark out of 125		
	A	B	C
2002	94 (75%)	79 (63%)	65 (52%)

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 examination paper was judged to be very accessible to students and the mean mark awarded for investigation reports was relatively high. As a result the grade boundaries were set a little above the notional values of 50%, 60% and 70%.

Comments on candidate performance

General comments

Examination
The overall performance of candidates was excellent.
There was no evidence that candidates were short of time.
There was a marked improvement in handling uncertainties and use of significant figures.
Candidates were weakest in questions involving descriptive answers.

Investigation
It appears that certain investigations are becoming "the norm" for certain centres. This may not be consistent with the philosophy of a true investigation.
It is important that the investigation gives students the opportunity for independent thinking.

Areas of external assessment in which candidates performed well

Examination
Knowledge of formulae, uncertainties, relativistic motion, Doppler effect and self inductance.
Generally, Unit 1 questions were attempted better than questions on other units.

Investigation Oral Examination
Candidates were well prepared and gave a good account of themselves.
Educationally, it is a great pity that the oral examination is to be scrapped. This view was reflected in all of the visiting examiners' reports.

Areas of external assessment in which candidates had difficulty

Examination

2 (c) Some candidates were unsure if the rim was at the edge or centre of the disc.
Many lost marks due to not fully explaining their answer.

3 (b)(i) Height above the earth required – must subtract radius of earth from calculated radius.

4 (a)(b) Period in part (a) often given as t in equation in part (b).

4 (c) (i) Many carried on to $d^2y / dt^2 = -\omega^2 y$.

5 (a) Many just guessed this answer. Young's slits kept cropping up.
(b) (i) Referred to mass and not wavelength.

6 (c) Some schools taught students the distance of closest approach to be given by

$$r = 2Qq / 4\pi\varepsilon_0 mv^2$$

While this is acceptable, it is advisable that candidates fully understand the Physics behind this relationship.

7 (b) (i) A - Many candidates failed to attain full marks in this description. No mention of vertical acceleration.

7 (c) $F = Bqv$ - several candidates took this v as representing voltage!

8(b)(ii) Although not in the syllabus some students have been taught

$$T = BInA\sin\theta$$

which can be applied to this question.

8 (b)(iii) Many thought that the force decreases as the coil rotates. The force remains constant!

Investigation
See feedback to centres.

Areas of common misunderstanding

Examination

As above plus:
4(a) confusion between A and a; T and t.
5(a) Uncomfortable with wave / particle experimental evidence.
8(b)(ii) Absolute uncertainty sometimes carried throughout all calculations.
10(b) Stationary wave – poor understanding. Many pictured this as two waves – the incident and the reflected wave π out of phase.

Investigation
See feedback to centres.

Recommendations

Feedback to centres

The vast majority of candidates were well prepared for the course.

Examination
There was a marked improvement in the handling of uncertainties.
Candidates should be told to take care with answers requiring an explanation. Generally, a two mark question will be broken into half marks. The marker will look for the key Physics points, so the candidate should give a detailed answer whenever possible.

Investigation
Some candidates were better informed than others. Principal teachers/senior lecturers should ensure that the students are given a full breakdown of the requirements.
While recognising that it may not always be possible, the examining team strongly recommends that all the candidates from a centre should attempt different investigations.
Where it is necessary for more than one candidate in a centre to undertake the same investigation, the candidates must be aware that they are not permitted to collaborate on their investigations.

Structure of the Report
Candidates should normally be advised not to group all graphs plus results at the back of the report in appendices. Appendices should only be used in this manner if there are numerous graphs etc. relating to the report. This is often not the case. The report should be easy to read with the results and graphs located in the appropriate place in the text.

Summary: the purpose and overall findings of the investigation were often omitted.

Introduction: including the Physics involved was varying quality.

Uncertainties: although most candidates could carry out the calculations, in many cases there appeared to be no true understanding of the purpose or significance of uncertainties. Calibration uncertainties were often ignored. Some centres need to give their students more practice in combination of uncertainties and uncertainties in trigonometric functions.

Use of IT: use of Excel or other packages. There is a need for students to be taught how to use these properly. This might be done in the Physics or Computing department using the HSDU exemplar material. Many candidates have difficulty with tables, graphs, line of best fit, size of graph, (0,0) point often not shown on graph, symbols, etc.
Use of IT is encouraged; however, candidates must make appropriate use of these powerful tools – as a working scientist would.

Timing of Report
It is obvious that many centres allow candidates time to submit their investigation right up to the SQA deadline. Many reports appeared not to have been read by anyone prior to submission as they contained numerous spelling, grammatical, arithmetic etc errors.
It is advisable to give candidates a strict deadline **well before** the final submission date.
It is worthwhile to encourage candidates to begin thinking about possible investigations at an early stage.

As a result of the NQTG decision that the interview should no longer continue new assessment criteria for session 2002-03 will be issued to centres.

In the vast majority of cases, investigations were found to be of an appropriate scale and commensurate with the demands of AH Physics. The following reports, submitted in 2002, were found to be inappropriate for this level:

Refractive Index – Higher method. (Snell's law) – one method used.
Measurement of g – one method, no comparison.
Measurement of focal length of lens – Standard Grade.
Double Glazing – use of Standard Grade Science model houses.
Resistance of wire – length, cross-sectional area, temperature.
Speed of sound – two microphones plus timer - Standard Grade.
Solar cell variables – angle, area, distance, colour – Standard Grade.
Speed of sound – clap – echo method.
Measuring rebound heights of balls – alone.
Specific Heat Capacity of different metals – Standard Grade
Study of friction – time spent on experimentation not appropriate.
Testing Batteries – using a data logger.
Collection of Outcome 3 experiments.

Each case was judged on its own merit. Some of the topics identified above had the potential to make excellent AH Investigations, but had not been taken far enough. For example, an investigation based on relatively simple physics initially, e.g. measurement of g, can be developed through the sophistication of the analysis, accuracy, comparison of different methods etc.

Generally, it was found that investigations developing Standard Grade ideas scored below average.
Use of Outcome 3 experiments is not acceptable unless they are extended in some way.