Principal Assessor Report 2005

Assessment Panel:	**Physics**

Qualification area

Subject(s) and Level(s) Included in this report	**Physics Standard Grade**

Statistical information: update

Number of resulted entries in 2004	18,170

Number of resulted entries in 2005	16,917

General comments re resulted entry numbers

The number of entries is down by 1253 on last year, continuing the drop in uptake first noted in 2003. This represents a drop of 6.9% - greater than the average drop across all Standard Grade subjects.

The only other change in the presentation pattern noted was a small rise in the number of candidates presented at the S3 stage in schools – up to 0.5% of the total presentations in 2005 from 0.2% in 2004.

Statistical Information: Performance of candidates

Distribution of overall awards

Grade 1	31.3%
Grade 2	26.9%
Grade 3	23.3%
Grade 4	8.2%
Grade 5	4.9%
Grade 6	3.4%
Grade 7	0.5%
No award	1.4%

Comments on any significant changes in distribution of overall awards

There are no significant changes in percentages or distribution of awards. This is because the cohort is perceived to be broadly similar to that of the last two years.

The percentage of candidates achieving a Credit grade award (grades 1 and 2) is 55% (56% in 2004 and 53% in 2003).

The percentage of candidates achieving an award at grades 1 to 4 (ie Credit and General grades) is 88% (90% in 2004 and 88% in 2003).

Grade boundaries for each assessable element in the subject included in the report

Assessable Element	Credit Max Mark	Grade Boundaries		General Max Mark	Grade Boundaries		Foundation Max Mark	Grade Boundaries	
		1	2		3	4		5	6
KU	50	30	21	40	17	10	40	7	n/a
PS	50	33	22	40	22	19	40	16	n/a

Comments on grade boundaries for each assessable element

There was a consensus of opinion that the Knowledge & Understanding element of the external examination, in particular in the General paper, was somewhat less accessible to some candidates than it could have been – in particular to the less well prepared candidates. The difference between marks gained for Knowledge & Understanding, and Problem Solving was far greater at the lower end of the ability range than at the top end.

As a result of the above observations, the grade boundaries agreed for the Knowledge & Understanding element have all been set lower than in past years. This is to reflect the impression gained from all of the evidence available that the cohort is broadly comparable to the cohort presented in 2003 and 2004.

The grade boundaries agreed for the Problem Solving element are all comparable to those agreed in recent years. This is because it was felt that there is no significant change in the cohort and also that the Problem Solving element of the examination was of a comparable standard to previous years.

Comments on candidate performance

General comments

The overall impression gained of this year's examination was that it was 'testing but fair'. Coverage of the syllabus was felt to be good – there were no areas of the syllabus being highlighted as not being adequately addressed.

Unusually this year, a significant number of candidates performed better on the Problem Solving element than the Knowledge & Understanding element. This difference was far more marked at the lower end of the ability range – those achieving an overall grade 4 often had a far greater differential between Knowledge & Understanding and Problem Solving marks than those achieving an overall grade 1. This seemed to indicate that a significant number of candidates who were perhaps inadequately prepared for the exam were able to pick up data handling Problem Solving marks.

There was evidence that some candidates did not perform as well in the Energy Matters Unit as in some other Units of the Course. However this was not reflected in the Space Physics Unit – marks were often picked up here where they were not in Energy Matters questions.

As in previous years, virtually all candidates seemed to have adequate time at both General and Credit levels.

Areas of external assessment in which candidates performed well

Candidates generally performed well in questions involving data handling – reading graphs; extracting information from tables; interpreting diagrams. Examples include:
General: Q7(a) (telephone oscilloscope traces); Q10(b) (I/V graph); Q13(a),(b) (hearing of animals); Q15(a) (seven-segment display); Q20 (Solar System)
Credit: Q1(b) (wavebands); Q4(a)(i) (Current graph); Q8(b) (I/V graph).

Also well done in general are questions involving the straightforward application of a single relationship, at both General and Credit levels. Examples include:
General: Q10(b)(ii) (resistance of a thermistor); Q14(c) (voltage gain); Q16(b) (acceleration and work done); Q18 (b) (shc calculation)
Credit: Q1(a) (wavelength); Q5(b)(ii) (supply current); Q6(b) (power of a lens) – better than in the past; Q6(c) (power of a laser); Q7(a) (half-life calculation); Q10(a),(b) (acceleration and average speed of a bobsleigh); Q11(a),(b) (mountain train); Q12(b)(i) (turns ratio); Q13 (energy); Q15(a),(b) (F = ma & v, d, t).

The use of 240 V for mains voltage is now confined to a very small number of candidates – old texts containing this value seem to have worked their way out of the system. Hopefully the change from 'dose equivalent' to 'equivalent dose', introduced for examination in and after 2006, will not take as long to work through the system.

Areas of external assessment in which candidates had difficulty

Unit conversions seemed to cause some candidates even more difficulties than in the past. For example, in General Q9(c), despite being told to 'calculate the number of kilowatt-hours', a lot of candidates converted hours to minutes or seconds while others did not convert watts to kilowatts.
With a number of questions (General Q10(b)(ii); Q21(b); Credit Q1(a); Q6(b)(ii); Q6(c)(i); Q8(b)(iii); Q12(b)(ii)(A); Q13(a) and Q15(a),(b)) a significant number of candidates found difficulty in handling units. In

all of these questions, wrong unit conversions often showed a basic lack of any 'feel' for the work candidates are doing. Typical of this type of error was treating 50 mA as 50 MA – and substituting 50 000 000 A instead of 0.050 A for the current in an electric toothbrush.

The description of how to measure the half-life of a radioactive source (Credit Q7(a)(i)) was very poorly done – perhaps because it is not an experiment that is carried out much in class any longer.

Two questions in the Credit paper merit special mention. Q1(c)(i) (Explain why the sound from the radio fades as the car enters the tunnel) and Q6(a) (What is meant by refraction of light?). Both questions elicited very few correct responses. It was decided by the examining team, and endorsed by the markers' meeting, that for Q1(c)(i) a correct response must include the term 'diffraction', used correctly. It was agreed by the examining team, and again endorsed at the markers' meeting, that 'bending' is not what is meant by refraction of light – Q6(a).
The vast majority of candidates answered Q1(c)(i) along the lines of 'The waves do not bend into the tunnel' – without saying why. By far and away, the most common answer to Q6(a) was 'Refraction is bending' – without any mention of an interface.
These two questions taken together, and in particular the loose use by candidates of the term 'bending' in both questions, show that the majority of candidates have a very poor grasp of these wave effects.

Recommendations

Feedback to centres

The feedback to centres is much the same as that of last year.

Encourage candidates to have a 'feel' for the work they are doing. This particularly applies to unit conversions – mA converted as if they were MA is more than just an arithmetical slip – it is a fundamental error in the understanding of Physics.

On a not too dissimilar theme, encourage candidates to look at a numerical answer and try to decide whether it is feasible. The voltage across a variable resistor in a transistor circuit operated from a 5 V supply is unlikely to be 10 000 V – yet this was a common answer to Credit Q8(b)(ii).

Impress on candidates the need to state the unit for all physical quantities.

Encourage candidates to look at the verb in a question and answer accordingly – state, describe, explain, calculate.