

Our ref: AS/NQ/MAR06

27 March 2006

Directors of Education  
Head of Centre  
SQA Co-ordinator  
Principal Teacher of Physics  
Teacher with responsibility for Physics  
Physics Lecturers

**For the attention of all staff responsible for the delivery of  
National Qualifications in Physics**

Action by Recipient	
	Response required
✓	Note and pass on
	None — update/information only

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Dear Colleague,

**National Qualifications Update — Physics**

This letter is intended to provide centres with information on developments in National Qualifications in Physics.

**Changes to Physics examinations**

Centres are reminded that the format of the **Intermediate 1** Physics exam is to change. For the 2006 exam the total mark is being reduced to 80 (from the current total of 84) but the time allocation will remain unchanged.

For the 2007 examination and beyond, the format will become similar to that for Intermediate 2 and Higher Physics, with section A comprising 20 multiple-choice questions and section B comprising 60 marks of extended answer questions of the type that currently make up the paper. The balance of Knowledge and Understanding and Problem Solving will remain the same. A revised specimen paper will be placed on SQA's website later this year ([www.sqa.org.uk](http://www.sqa.org.uk)).

For the 2006 examination and beyond, **Intermediate 2** Physics is to incorporate a **data sheet** similar to those in other Physics papers, but appropriate to the level. A copy of the data sheet is included as an appendix to this letter and it is also available on the Physics page of SQA's website.

## Principal Assessor reports

The Principal Assessor (PA) reports for the 2005 diet of examinations are available on the NQ Physics subject-specific page of SQA's website.

The PA reports contain statistical information on candidate entries, grade boundaries and comments on candidate performance, highlighting areas where candidates performed well and areas in which candidates had difficulty.

It is recommended that centres download these as they contain a wealth of information that can be used to inform learning and teaching.

## Senior Moderator reports

The Senior Moderator reports for 2005 will be posted on SQA's website early in 2006. The Senior Moderator reports include general information on the moderation events and specific issues identified for the following areas:

- ◆ Standard Grade Physics Practical Assessment
- ◆ NQ Access 3 — Advanced Higher Unit Assessment
- ◆ Advanced Higher Physics Investigation Unit Assessment

It is recommended that centres download these as they contain important information on internal assessment issues.

## Marking instructions

The detailed marking instructions for Physics (Standard Grade, Intermediate 1, Intermediate 2, Higher and Advanced Higher) for the 2005 examinations are available on SQA's website.

## Electronic marking of objective tests

SQA adopted electronic marking of objective test sections of examinations in 2005 and this practice will continue in 2006. Candidates will be issued with an answer sheet that contains their pre-printed personalised details. **However, as from 2006, candidates will be required to complete the answer sheet using an HB pencil.** If a candidate wishes to make a change to an answer they must do so by using an eraser. Posters will be distributed to centres informing them of this change, so that, prior to sitting the examination, candidates will be familiar with the new procedure for completion of their answer sheet.

## Moderation

Retrospective moderation of the Advanced Higher Physics Investigation took place in August 2005. Twenty centres were selected and required to submit evidence for the Unit assessment of the Physics Investigation.

There was a significant improvement in the standard of evidence provided by centres this year. The issues highlighted last year continue to be issues for a number of centres this year.

In the ‘daybooks’ from some centres, very little evidence of planning was identified. One purpose of the Investigation is to help promote good scientific practice and as such the ‘daybook’ should form a proper, working scientific document of all the work undertaken by the student. Centres are reminded that this **must** include the relevant planning, such as:

- ◆ the aim/purpose of the investigation
- ◆ the rationale behind why particular methods have been chosen or why ideas have been rejected
- ◆ notes on the design/selection of experimental methods
- ◆ notes on research undertaken
- ◆ contributions made by others

For Outcome 2 the record of work **must** include both the results taken **and** the analysis of these results.

- ◆ tables of results must have correct headings, units and correctly entered readings
- ◆ analysis of results should be presented in an appropriate format. This could be tabular, graphical or often both
- ◆ appropriate treatment of uncertainties

Again this session some centres indicated that this information was included in the final report and not in the ‘daybook’, however ‘evidence submitted for moderation must include all of the evidence that you use to determine that each candidate included in the moderation sample has achieved this Unit. For each candidate the evidence must cover both outcomes of the Unit.’ (page 18 of NAB).

There still appears to be a misunderstanding in some centres about the function that the ‘daybook’ or record of work forms the assessment for the Unit and that the Unit requirements are not simply a continuation of the function of the ‘daybook’ for CSYS Physics. The evidence for the NAB **must** be marked by the responsible teacher/lecturer and internal moderation is desirable, if resources permit. Successful centres adopted a strategy of either marking on the ‘daybook’ when PCs had been passed or using the pro forma provided in the NAB.

A large number of the issues identified could easily have been avoided if candidates had been issued with, or made use of, the Candidate’s Guide on pages 22–24 of the NAB.

When starting investigations candidates **must** be issued with the appropriate documentation:

- ◆ Candidate’s Guide (pages 22–24, Physics Investigation D388 13/NAB001)
- ◆ Course guidance for candidates ([www.sqa.org.uk](http://www.sqa.org.uk))

Centres should note that if they have candidates who have passed the Unit assessment for the Investigation but have not submitted an investigation report for the external assessment, then the centre is likely to be selected for retrospective moderation.

Preparations are currently underway for central moderation at Easter.

Centres are reminded that if they are selected for Standard Grade moderation they must submit a **complete record** of the candidates’ attempts at the Practical Techniques.

It is a requirement of the Course that candidates are given the opportunity to attempt all eight techniques, and **not** simply sufficient techniques to take them above a grade boundary. On occasions, due to absence, pupils may miss a technique. It is essential, in these cases, that the record or flyleaf has some comment to reflect this. Please note that a blanket letter saying that all candidates were given multiple opportunities to attempt the techniques will **not** be accepted in place of a complete record.

If selected for NQ moderation, centres are reminded that they must submit both a NAB test and a complete Outcome 3 report, and that this report should be marked, either by annotating the actual report or by using the pro forma provided in NAB001 of each Unit.

### **Professional Development Workshops**

At the beginning of November 2005 the SQA ran a workshop detailing how Intermediate 1 and 2 Physics are marked and common issues and misconceptions that candidates display. This was aimed at helping practitioners understand the procedures and standards applied at this level. Approximately 60 Physics teachers from across Scotland attended the event and the workshops were very well received by the delegates.

A big vote of thanks goes to the Intermediate Physics team for their hard work and dedication in preparing and running the workshops and making the event such a success.

Planning is underway for a similar event in November of this year looking at Advanced Higher Physics, including the Investigations.

### **Access 3/Intermediate 1**

I have received a number of enquiries relating to entries for Access 3/Intermediate 1 Physics. In particular, what to do about pupils who have a number of Units passed at Intermediate 1 and a number of Units at Access 3, or what to do about a pupil who passes all Units at Intermediate 1 but then fails the exam.

Firstly, queries regarding entries should normally be made through your SQA Co-ordinator to the Customer Account Manager (CAM).

If a candidate has been entered for the Intermediate 1 Course and Units and subsequently passes at least one of the Units at Access 3 level, the Course entry should be amended to Access 3 along with those Units achieved at Access 3. The entries for those Units they pass at Intermediate 1 should be left at that level, so that the candidate is credited with an Intermediate 1 pass for the Unit. The Outcome 3 reports for Intermediate 1 will cover the assessment requirements for Outcome 2 at Access 3. Deadlines for submissions of entries can be found in the Operational Guide, which can be accessed on SQA's website or from your SQA Co-ordinator.

In cases where a candidate passes all Units at Intermediate 1 and then fails the examination, the candidate will have the Unit passes on their certificate, but they are not automatically credited with an Access 3 Course award. In order for candidates to be automatically credited with a pass for the Access 3 cluster a dual entry should be made, on paper, for the Access 3 Course code only (C069 09).

## Appeals

There continues to be a welcome improvement in the standard of evidence being submitted to support appeals and the success rate for appeals has increased for most levels of Physics this year.

One of the most common reasons for appeals failing continues to be **incomplete evidence for the Course**. This was particularly the case for Standard Grade and Intermediate 1, where it was not uncommon to find a prelim covering five Units as the only evidence. It is important that when submitting appeals the evidence demonstrates candidate attainment across the **whole** Course.

Centres are reminded that for an appeal for a grade C a **high scoring** NAB may be submitted as additional evidence, but this is not valid evidence to support an appeal at A or B.

Centres should also note that only the current years' commercial papers can be used in their entirety and there is an important caveat that centres must check the standard of these before using them. SQA does not validate commercially produced papers in any way. Unfortunately, once again, a significant number of centres did not follow the advice on use of commercial papers this year.

The specimen question papers on SQA's website and the appeals exemplification material are not suitable sources of evidence.

Centres are referred to the SQA publication *Estimates, Absentees and External Assessment Appeals: guidance on evidence requirements April 2004*, which contains clear guidance on generating evidence.

I hope you find the information in this letter helpful. If you require further clarification please do not hesitate to contact me. I can be contacted in a number of ways: via e-mail, by telephone using the contact details on the first page, and also via the e-mail link on the Physics pages of SQA's website ([www.sqa.org.uk](http://www.sqa.org.uk)).

Yours faithfully



Andy Shield  
Qualifications Manager  
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Qualifications Directorate

# Appendix

## DATA SHEET

### Speed of light in materials

Material	Speed in m/s
Air	$3.0 \times 10^8$
Carbon dioxide	$3.0 \times 10^8$
Diamond	$1.2 \times 10^8$
Glass	$2.0 \times 10^8$
Glycerol	$2.1 \times 10^8$
Water	$2.3 \times 10^8$

### Speed of sound in materials

Material	Speed in m/s
Aluminium	5200
Air	340
Bone	4100
Carbon dioxide	270
Glycerol	1900
Muscle	1600
Steel	5200
Tissue	1500
Water	1500

### Gravitational field strengths

	Gravitational field strength on the surface in N/kg
Earth	10
Jupiter	26
Mars	4
Mercury	4
Moon	1.6
Neptune	12
Saturn	11
Sun	270
Venus	9

### Specific heat capacity of materials

Material	Specific heat capacity in J/kg °C
Alcohol	2350
Aluminium	902
Copper	386
Glass	500
Ice	2100
Iron	480
Lead	128
Oil	2130
Water	4180

### Specific latent heat of fusion of materials

Material	Specific latent heat of fusion in J/kg
Alcohol	$0.99 \times 10^5$
Aluminium	$3.95 \times 10^5$
Carbon dioxide	$1.80 \times 10^5$
Copper	$2.05 \times 10^5$
Iron	$2.67 \times 10^5$
Lead	$0.25 \times 10^5$
Water	$3.34 \times 10^5$

### Melting and boiling points of materials

Material	Melting point in °C	Boiling point in °C
Alcohol	-98	65
Aluminium	660	2470
Copper	1077	2567
Glycerol	18	290
Lead	328	1737
Iron	1537	2747

### Specific latent heat of vaporisation of materials

Material	Specific latent heat of vaporisation in J/kg
Alcohol	$11.2 \times 10^5$
Carbon dioxide	$3.77 \times 10^5$
Glycerol	$8.30 \times 10^5$
Turpentine	$2.90 \times 10^5$
Water	$22.6 \times 10^5$

### Radiation weighting factors

Type of radiation	Radiation weighting factor
alpha	20
beta	1
fast neutrons	10
gamma	1
slow neutrons	3

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