Introduction
In 1999 the Board of Studies introduced, as part of the School Certificate, a test of foundational knowledge and skills in Science. The test provides a measure of students’ achievement in this area at the end of the compulsory years of schooling.

Students’ test results complement the information contained in the School Certificate Record of Achievement Part A. This document is a cumulative record of all Stage 5 courses completed, and the grades (A, B, C, D, E or N) awarded by the school on the basis of Course Performance Descriptors.

Student performance in the School Certificate tests is reported in relation to standards (or levels of achievement). Specifically, students receive a mark (out of a maximum possible score of 100) and a place within a performance band. Six performance bands are used, with band 1 covering the range of marks from 0 to 49, band 2 covering from 50 to 59, band 3 covering from 60 to 69, band 4 covering from 70 to 79, band 5 covering from 80 to 89, and band 6 covering the range of marks from 90 to 100.

With the exception of band 1, the level of achievement represented by each performance band is described in a statement summarising the knowledge and skills typically demonstrated by students who have achieved that performance band. There is no statement corresponding to band 1, which is considered to be below the minimum standard expected.

Students are awarded a particular band (and mark) if they demonstrate they have reached the performance standard associated with that band. There is no predetermined proportion of students to be awarded each performance band. Since the same standards are applied each year, it is possible to make comparisons between the performances of students who have sat for the test in different years.

How the standards were applied to determine the band cut-off marks for the 2002 School Certificate Science test
Following each of the previous School Certificate Science tests a “Standards Package” was prepared. Each Standards Package contained three types of material which, when taken together, clearly illustrated the performance standards to be used to assess and report student achievement in the School Certificate Science tests. Each Standards Package consisted of:
• the band descriptions, which summarised the knowledge and skills typically demonstrated by students in each band
• the Science test paper
• copies of the responses produced by a sample of students whose marks were equal to the borderline between two bands.

These Standards Package were the starting point for determining the cut-off marks corresponding to the borderline between each performance band in 2002.

Following the marking of the 2002 test a team of highly experienced teachers/markers was established. The team followed a structured standard-setting procedure to determine what test marks would represent the borderline between bands 1 and 2, bands 2 and 3, and so on. This procedure involved the use of special statistical data and student responses to inform the professional judgement of the teachers (referred to as judges). The procedure is outlined in the steps below.

**Step 1**
The first step in the process was to have the judges individually consider the material in the Standards Package and develop an image of the type of students described. That is, each judge developed an understanding of the knowledge and skills typically possessed by students on the borderline between two bands.

The judges then considered each test question in turn. For questions that were scored dichotomously (ie right or wrong) each judge recorded the probability that a borderline student would get the question right. For questions that were scored polytomously (eg problems involving several steps) each judge recorded the mark the judge believed a borderline student would receive.

Each judge’s borderline marks for each question were then added to give the judge’s cut-off marks between the bands. Each judge then looked at the total cut-off marks they had created to check that they were satisfied with the outcome.

The average of the borderline marks between bands 5 and 6 proposed by each judge was calculated. This value was the initial cut-off mark between band 5 and band 6. A similar process was followed for the other borderlines.

**Step 2**
The next step involved the judges meeting to compare and discuss the decisions they had made individually. This process also involved them in reviewing various statistical reports of student performance.

A random sample of students was selected and the marks they obtained on every question on the test extracted. These data were then analysed and presented in a form that made it easy for the judges to see how students at various ability levels performed on the questions.

The judges reviewed and discussed the statistical data. During these discussions they had the opportunity to modify any question cut-off marks they had previously set. If their earlier values and the values predicted by the statistical analysis were different,
the judges were not required to change their values; that is, they had the choice of whether to change or not.

For each borderline, after all changes were made, the cut-off marks proposed by the judges for each question were averaged. The averages for all questions were then added to obtain a cut-off mark for that borderline.

At the end of this step a revised set of cut-off marks was available.

**Step 3**
The next step in the procedure was to have the judges consider a sample of student scripts that had been awarded marks equal to, below, and above the cut-off marks they had established.

In reviewing these scripts the judges were asked to assure themselves that the scripts awarded the cut-off marks demonstrated levels of performance that were on the borderline between two bands. The judges then looked at scripts awarded marks on either side of the cut-off marks to confirm their decisions.

At the conclusion of this process, the judges’ final cut-off marks were applied to the mark distribution from the test and bands were allocated to students accordingly. This was done by setting the averages of cut-off marks that the judges had determined, to the band borderline marks of 50, 60, 70, 80 and 90 that are shown on the performance scale.

**This package**
Samples of student responses that were awarded the final band cut-off marks established by the judges were collected and have been included on this CD-ROM. Also provided are the statistics on how those students who were placed on the borderline of two bands performed on the multiple-choice and other objective items, a copy of the 2002 test paper, and a copy of the band descriptions. As for the previous packages, this material will form an essential part of the judging operation in future years by exemplifying and clarifying the standards that are applied.

**The Purpose of the CD-ROM**
The CD-ROM is designed to serve two purposes:

- to equip the team of judges, who will have the task of determining what test marks will represent the borderlines between the performance bands for future tests, with clear and concrete information showing the standards they are to apply
- to give teachers a clearer understanding of the standard of work required of students in order to achieve each performance band.
The structure of the material
For each section of the test requiring an extended response, the responses of three students, whose work was of the standard typical of students placed at the borderline between band 5 and band 6, are provided. The responses of three students whose work was typical of students at the borderlines between band 4 and band 5, band 3 and band 4, band 2 and band 3, and band 1 and band 2 have also been provided.

This material is organised in such a way that if a particular section or question from the test paper is selected, and then a particular borderline between two bands, it is possible to view, in turn, the responses of each of the three students at that borderline.

In the case of those sections of the paper containing multiple-choice questions or short problems, information is provided in table and graphic form showing how students at each borderline responded to each question.

How it can be used
By looking at each question students were required to answer and then studying the responses of the students, teachers will gain a very clear understanding of the standard of work typically produced by students at the borderline between each band. This understanding will be further enhanced when teachers re-read the band descriptions used to report student achievement and match these descriptions to their images of students at each borderline.

Where a section of a paper consists of multiple-choice questions, a table and graph are provided for each question. For the groups of students whose marks are equal to the borderline between two bands, the percentage of each group that selected each of the responses A, B, C and D is given. By reading the question and then looking at the student responses, teachers will develop an understanding of how well students at each borderline answered each question, and importantly, the types of errors students tended to make. This analysis will help to provide a picture of the level of knowledge and skills typical of students at each level of performance.

Other sections of a paper consist of free-response questions, some that require a short answer (eg a number or diagram or word), others that require an extended answer (eg a solution to a problem). In these cases copies of the students’ responses are provided, or in the case of some questions the proportions of borderline students who obtained the correct answer. Teachers can look at the questions students were required to answer, study the actual responses students provided and then read the corresponding band descriptions to ascertain why the work of these students was typical of that demonstrated by students placed at the borderline of the two bands.