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Examiners' Report Summer 2009

Internal Assessment Activities (IAAs) and Centre Devised Activities (CDAs)

GCSE

360Science

GCSE Science (2101)
GCSE Additional Science (2103)
GCSE Biology (2105)
GCSE Chemistry (2107)
GCSE Physics (2109)

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Summer 2009

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in GCSE Science 2101, Additional Science 2103,
Biology 2105, Chemistry 2107 and Physics 2109.
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Overview

The summer 2009 session was the first opportunity to assess the new style Edexcel-devised Internal Assessment Activities (IAAs). The new IAAs have been designed to focus only on process skills, in the context of the topic being tested, and are not designed to test knowledge of the specification statements. The IAAs have questions testing; Planning (P), Extracting Information and Using Data (EIUD), Interpretation Judgement and Opinion (IJO).

The Principal Moderators are very pleased to report that the majority of centres submitted IAAs which were identical to, or close to, those of the standards set. This is an indication of the fact that most centres are correctly applying the guidance and advice offered during the series of free training events, the support materials on the 360 Science website and other training opportunities, to arrive at sound professional judgements relating to the performance of their students. The majority of centres made an excellent attempt to adapt to this new assessment style, and are to be congratulated on the way they have carried out their responsibilities in this first year of the new style internal assessment activities.

The new style IAAs are designed to discriminate between students of different ability levels. The marks achieved this session ranged from single figures to the maximum mark of thirty six. It was evident that in the majority of centres, science teachers had carefully applied the assessment criteria and had carried out internal standardisation in a professional manner.

It was also very clear that in almost all centres, the advice relating to the carrying out of the suggested practical work had been followed and that their students had benefited as a result. As a good practice we suggest that following the completion of practical work relating to each IAA, teachers should spend some time with their students giving hints and tips about issues such as the detail needed to include in the writing of a plan, the meanings of terminology such as "reliability" and "validity", how best to present data in graphs, how to describe the pattern in a graph using scientific ideas, and how best to deal with the data in coming to a conclusion.

In addition, prior to the taking of the IAA by students, the relevant "students information sheet" should be explained and given to students (please see the rubric for each IAA). The assessment must take place under controlled conditions within the normal teaching environment and a timed duration of up to 45 minutes. Following the teacher assessment, extracts from student work can be used for formative assessment in preparation for students taking subsequent IAAs. Alternatively, teachers may scan in some selected sections and project these to the class in order to elucidate teaching points. Students can also view their own assessed IAA under controlled conditions. Suggested methods include one to one discussion between the teacher and the student or a "no bags/pens/pencils" look as a starter or plenary.

We suggest teachers read the rubric for each IAA carefully, especially with regard to the attachment of student graphs from in class experimental work. Some IAAs require these graphs, others do not. Moderators found some instances where graphs should have been attached, but were not. Attaching graphs to the IAAs in cases where they are necessary, helps to support how students arrived at their responses and also explains why these were credited by teacher-assessors. Therefore teachers are encouraged to please check the information to teachers carefully for the benefit of their students.

The Generic Assessment Grid

Levels of Performance Stages	Mark Band 1 Performance not worthy of credit	Mark Band 2 Low level performance	Mark Band 3 Standard level performance	Mark Band 4 High level performance
Planning	*Students can* only give isolated facts not specifically related to the task under consideration 0 Marks	*Students can* a. show some awareness of how scientific information can be collected b. plan a simple scientific task 1 – 4 Marks	*Students can* a. show awareness of how relevant data for a task can be collected b. plan a scientific task to collect relevant data 5 – 8 Marks	*Students can* a. show awareness of how valid and reliable data can be collected b. plan a scientific task to collect valid and reliable data 9 – 12 Marks
Principal Moderator comments:	*At this mark band students cannot produce any kind of a coherent plan, or draw an appropriate diagram.*	*At this mark band a simple description of a plan is all that is required. It may well be incomplete and / or inaccurate. Any simple diagrams may be inaccurate and /or incomplete. In the b strand students make some attempt to adapt their diagrams and / or plans to a new situation.*	*At this mark band students normally provide a logical and fairly detailed account of their in class work and can normally apply the skills learned to a new situation (in the b strand). Any diagrams are normally sufficient to convey understanding and are labeled appropriately.*	*Students normally provide a very good account of their plan, and/or draw fully labelled diagrams in this mark band. They are clear about the meanings of validity and reliability. Students understand the need to change only the independent variable, and they know the reasons why readings are repeated, means taken, and how anomalous results should be dealt with. In the b strand they are confident when adapting their plans and / or diagrams to new situations.*

Extracting information and using data.	*Students can* only repeat information given without selectivity and make no further use of the data 0 Marks	*Students can* a. present data in a simple way b. identify simple patterns in data 1 – 4 Marks	*Students can* a. present data as instructed b. identify patterns in data using scientific ideas 5 – 8 Marks	*Students can* a .choose an appropriate method of presenting data b. identify detailed patterns in data applying relevant scientific principles. 9 – 12 Marks
Principal Moderator comments	*At this mark band students are unable to draw any sort of graph or suggest what any type of graph shows.*	*At this mark band students can normally spot errors in graphs, and / or complete simple bar charts. They can normally state what the graph shows in a simple way i.e. "as X gets bigger Y gets smaller", "the graph goes up" or similar.*	*At this mark band students can draw a simple bar chart, or complete a line graph using information from a data table. In addition to stating what the graph shows, they can normally say "the graph is linear", "there is a positive correlation" or similar, but with little or no further comment or explanation.*	*At this mark band students can normally correctly scale the axes of a graph, label the axes, plot the points accurately and draw an appropriate line of best fit. They can also explain terms such as directly proportional or inversely proportional etc., referring to the graph they have drawn, giving quantitative examples of the relationship shown.*
Interpretation judgement and opinion	*Students can* only repeat the information given and offer no relevant interpretation, judgement or opinion.	*Students can* a. draw a simple conclusion using data in an elementary way b. make a valid comment on procedures and / or results c. recognise a benefit and / or a drawback of a simple, familiar, scientific development	*Students can* a. draw a conclusion showing awareness of the appropriate science using data qualitatively and/or quantitatively. b. make valid comments showing awareness of the appropriate science c. recognise	*Students can* a. draw conclusions showing detailed appreciation of the appropriate science, using complex data qualitatively and / or quantitatively. b. evaluate the strength of the evidence and / or suggest how validity and / or reliability of results can be improved.

	0 Marks	1 – 4 Marks	benefits and /or drawbacks of scientific developments 5 – 8 Marks	c. demonstrate a good understanding of benefits and /or drawbacks of scientific developments. 9 – 12 Marks
Principal Moderator comments	*At this mark band students are normally unable to attempt any meaningful comment on data, text, or graphical information presented to them.*	*At this mark band students are normally able to offer a simple conclusion, and a meaningful comment on the method used or the results obtained. They can normally also give a relevant comment on a simple scientific development.*	*At this mark band students can normally explain a conclusion using relevant scientific understanding which may be either qualitative or quantitative. They can offer opinions on the results or graphs showing some awareness of the relevant scientific background. They can also discuss in a simple way the benefits and / or the negative aspects of scientific developments.*	*At this mark band students show a good understanding of the results, or graph, can go on to perform a complex calculation, and / or discuss in detail the finer points of a complex graph – ie the need to take more points around a peak or trough to be sure of the shape, etc. They can discuss where further evidence (ie more data points) is needed, or state giving reasons, if they think there is sufficient evidence for a firm conclusion. Given some data they can identify how validity and / or the reliability of the task can be improved. They can also discuss in detail the benefits and / or the negative aspects of recent scientific developments.*

Comments on Series 3 IAAs

Unit 5002 (GCSE Science -Biology)

B1a topic 1 Investigating germination:

We suggest that fresh seed should be used for this investigation, and that natural variation in germination rates is to be expected. In EIUD b) students were normally able to identify patterns in the data which would take them into Mark band 3. To improve their performance, they should use scientific ideas to support the pattern they have seen, for example, "one group of seeds germinated faster than the other, then slowed down because……"

To gain mark band 4 students need to apply relevant scientific principles to the pattern and they could refer to physiological processes within the seeds, and/ or the effect of competition.

B1b topic 3 Investigating reaction times:-

Some centres used a computer program here, but that unfortunately may make it difficult for the students to comment on the taking of valid and reliable results. Carrying out the actual practical work is recommended. In EIUD students often tended to describe the more obvious pattern, eg "as the concentration of caffeine increases the reaction time decreases" (mark band 2, b strand) but most did not go further and describe a numerical pattern eg "as the concentration of caffeine increases by 100mg dm^{-3} the reaction time decreases by 5 ms." (mark band 4, b strand).

Unit 5003 (GCSE Science - Chemistry)

C1a topic 5 Investigating temperature changes during chemical reactions:-

In the planning section one suggestion for the taking of valid results would be the use of an insulated polystyrene beaker (or similar) to reduce heat loss to the surroundings. In EIUD it is not necessary in the final question for students to suggest an explanation in terms of the oxide layer. They could just say that aluminium does not react because something prevents the metal from reacting as it should – (as shown by its position in the reactivity table) – with the copper sulphate solution. In IJO credit for the graphical question should be awarded on the strength of the arguments (for, or against) put forward by students.

C1b topic 7 Heat from burning alcohols:-

A labelled diagram showing the assembled apparatus received more credit than a pictorial apparatus list. In EIUD many students could have improved their achievement by recognising that the data is non linear and a curved best fit line is most appropriate. We suggest centres spend more time on discussing with students when bar charts, or line graphs, are appropriate. The question on bio-fuels gave variable quality of answers but the able students could give points both in favour, and against the use of bio-fuels.

Unit 5004 (GCSE Science - Physics)

P1a topic 9 Investigating light dependent resistors:-

Students could improve their performance in planning by having a clear understanding of the terms "independent variable" and "dependent variable". In IJO, improving validity may be achieved through a consideration of a wider range of results when using Mike's computer.

P1b topic 11 Investigating sound:-

A diagram in planning is optional, but it may help students to clarify their answers. Although students were generally able to draw in the best fit line for the graphs in EIUD, some could have improved their performance by the careful plotting of points and / or the drawing of a thin best fit line (ie without the use of "tram lines").

Unit 5012 (GCSE Additional Science – Biology)
B2 topic 1 Measuring the effects of exercise :-
Students were generally able to achieve band 2 in planning but they could have improved their performance by listing the steps taken, in order, and by giving some information regarding the measuring instruments they used. In EIUD more able students could provide scales for the axes which made good use of the graph paper provided. In IJO students need to identify which investigation they are referring to when improving reliability.
B2 topic 3 Investigating the effect of variables on the rate of photosynthesis:-
In general students could describe the steps taken in their investigation, though answering the question on the collection of valid and reliable data was often difficult for those students who had done a computer simulation. Only the more able students were able to offer an explanation for the shape of the graph in EIUD.

Unit 5013 (GCSE Additional Science – Chemistry)
C2 topic 5 Finding a chemical formula by doing a practical experiment:-
A labelled diagram showing the assembled apparatus received more credit than a pictorial apparatus list. In EIUD the most able students were able to describe the direct proportionality shown by the graph quoting quantitative figures from the graph. In IJO candidate performance could have been improved by reference to the oxide which is released into the air, as the lid is periodically raised. Students were generally able to complete the calculation.
C2 topic 6 The alkali metals halogens and their compounds:-
Most students could attempt a diagram of the apparatus used to electrolyse sodium chloride solution, but only the more able were able to adapt this diagram to one appropriate for the collection of copper from copper sulphate solution. In EIUD candidate performance could have been improved by realising that the boiling points given were too high for Bunsen burners to reach, and knowing that a bar chart is preferable to a line graph where the data are discrete.

Unit 5014 (GCSE Additional Science – Physics)
P2 topic 9 Investigating acceleration:-
A number of Centres varied force instead of mass and it was obvious from the students' responses that there was confusion between mass and weight. It was also noted that some Centres used a slope to provide the force to accelerate a car/trolley and then changed the mass of the car/trolley. Acceleration was found from time and the distance down the slope. This does not work as the velocity at the bottom of the slope is independent of the mass using $\Delta GPE = \Delta KE$.
P2 topic 11 Investigating a model of radioactive half-life:-
A diagram in planning is optional, but it may help students to clarify their answers when writing about their plans. In EIUD performance was enhanced when students showed on the graph how they had arrived at their answers. Although students were generally able to draw in the best fit line for the graphs in EIUD, some could have improved their performance by the careful plotting of points and / or the drawing of a thin best fit line (ie without the use of "tram lines").

Administration
The annotation of scripts was variable. Centres which produced thorough annotation to show why marks had been awarded were generally in closer agreement with the moderators' marks. In some Centres teachers merely placed ticks alongside the work. In some cases ticks placed at random in the scripts were not a great deal of assistance in moderating the IAAs. The practice of just ticking work should be discontinued in favour of using the criteria and annotation to good effect. Accurate assessing invariably occurred when centres made explicit references between

the submitted work and the generic assessment grid. This also greatly aided the moderation process. Comments such as:

- "low band 3"
- "upper band 4"
- "just into band 2" etc,

are some examples to follow when providing annotations. Such comments should be added alongside the work, at the point of achievement. These annotated comments in each skill area make the final judgement as to the overall quality of the work in each skill area much easier. It is not necessary for teachers to write any more than the examples provided above. Nevertheless teachers may provide more annotation to support their judgements if they wish.

Evidence of internal standardisation was seen and in many cases it was clearly effective. However care needs to be taken to ensure that one of the sets of marks on the student IAAs transfers accurately to the marks on the OPTEMS forms, Edexcel Online or EDI submission.

In some centres the questions on some of the scripts were given numerical marks which were then aggregated to arrive at a total. This is an inappropriate procedure as it defeats the purpose of a generic grid, and is not recommended. Other assessment and moderation difficulties included:-centres making up their own mark schemes that were wholly inappropriate to the specification criteria, and in cases where two mark bars were to be found in one skill area some centres awarded only the highest mark – and so were making non-holistic judgements. It is imperative that in cases where there are two sections to each skill area, teachers must judge the quality of the work as a whole across both sections of the skill area.

Some centres added lined paper for students to use, and this is an idea which deserves consideration by teachers. Students must be prompted to request extra paper for questions where this is appropriate, as otherwise by limiting their answers to the space provided some students may not include sufficient detail to fully demonstrate their abilities.

Students who had actually performed a practical experiment, in general, performed better in terms of being able to plan and discuss improvements to the experimental design. This procedure also allows for variation in the quality of diagrams.

Some centres apparently did not give students the opportunity to do the recommended practical work before commencing the IAAs, and in other centres there were a number of computer simulations or teacher demonstrations used. Those doing simulations invariably drew very similar diagrams. It is not recommended for students to draw the pieces of individual apparatus. We would prefer to see the assembled apparatus, with each item labelled. In some of the centres which had not actually performed the practical work, for example in the speed of sound experiment, the method described in the plan was wholly impossible, given the apparatus described, yet it was described as actually being undertaken. These Centres awarded very high marks for a description that was invalid and patently unreliable.

Full and detailed answers to the reliability and validity questions are the discriminators for band 4 marks, especially in the planning section. (Please refer to the glossary "Definitions of some Useful Scientific Words" published in February 2009 on the science subject pages of the Edexcel website for full details of the meanings of the terms reliability and validity). When discussing reliability, most students were able to say "repeat the test" but many were unable to go on to discuss the treatment of anomalous results, the obtaining of concordant data, and the averaging of concordant results. To many students validity simply meant "fair testing" though many failed to expand on the meanings of these words, i.e. to discuss the controlling of all variables except the independent variable.

Series 3 IAAs

The current set of IAAs (series 3) is still valid for submission until May 2010.

Series 4 IAAs.
The latest set of IAAs (series 4) was published on the 360 Science website in late June 2009. This set is now available for use and is valid until May 2011. There is now one IAA available for every topic in units B1, C1, P1, B2, C2 and P2.

Further Support

Consultancy

- Centres are advised to make use of the free consultancy service for IAAs. Centres can send up to three marked IAAs per GCSE subject, (Science, Additional Science, Biology, Chemistry or Physics) to a Principal Moderator in order to receive advice on their standards of assessment. Please refer to the Consultancy booklet on the science subject page of the Edexcel website for full details.

Tutor support and exemplar materials

The following support and exemplar materials are available of the Science subject page of the Edexcel website:

- List of practical activities linked to the IAAs for both series 3 and series 4 IAAS;
- Issue 3 of Frequently Asked Questions (FAQs) published in January 2009;
- Internal Assessment Guidance for GCSE Science (2101) and GCSE Additional Science (2103) published May 2008;
- Exemplar IAAs in Biology, Chemistry and Physics;
- Exemplar student work in Biology, Chemistry and Physics IAAs, with moderated marks and commentaries;
- Definitions of Some Useful Scientific Words

Customer service

- Teachers can continue to send in queries and questions via Edexcel's "Ask The Expert" email service. These questions are normally answered within two working days by either the subject advisor at Edexcel, the Chief Examiner, or a Principal Moderator;
- You could also get expert advice on your Science queries by phone to the Science subject advisors on 0844 576 0037 (home centres), +44 (0)1204 770696 (from outside the UK) or by email to: ScienceSubjectAdvisor@edexcelexperts.co.uk
- You could log on to the Edexcel Science community forum designed to enable you to access peer-to-peer support from fellow Edexcel teaching and delivery staff in schools

and colleges. You can obtain an Edexcel online password to use our communities forum, by contacting our online services team on 0844 576 0024.

Training

- In the academic year 2009-10 Edexcel is planning to run a comprehensive training programme of both full day and half day courses relating to the IAAs. For further information or to book onto a training event, please visit our website at: www.edexcel.com/training.

Report on Edexcel Centre-Devised Internal Assessments (CDAs)
in GCSE Additional Science 2103,
Summer 2009 Examinations

Overview

Edexcel Centre-Devised Internal Assessment (CDAs) in GCSE Additional Science are one of three alternative modes of examination for B2, C2 and P2 units. CDAs in these units each count for 10% of the overall marks for the examination. Centres opting for this mode of internal assessment can choose up to three CDAs per student (one from each of B2 C2 or P2), so this form of assessment can count for 10, 20 or 30% of a student's marks.

The Principal Moderators are pleased to report that some exemplary work was seen and some Centres produced innovative assignment briefs which fitted in well with the unit(s) being studied. We strongly encourage teachers to develop their own material, possibly using exemplar material as a framework and adapting it to make good use of the local environment and to maximise the potential of the students in their Centres. However, as in the first year of this mode of assessment, majority of Centres used the exemplars found in the guidance material provided by Edexcel.

The design of CDA tasks can allow for a range of methods of presentation. The written report was the most popular, but some students explored other methods of presentation, such as booklets, PowerPoint presentations and posters. The standard of ICT skills seen was excellent in many cases.

We were pleased to see that in some Centres the assessment criteria had clearly been shared and discussed with students before assignments had been started. This raised students' awareness of how they should approach their task in order to maximise their performance. Using sub-headings in the design of assignments to cue appropriate responses was also a successful strategy. This approach is perfectly acceptable as long as students are not given undue assistance.

It was noted that some Centres provided students with a structured format requiring answers to be given to a list of questions based upon data provided. This is not a recommended strategy for more able students since this approach can limit attainment, although it is suitable for less able students.

Whilst students are encouraged to use the Internet as a valuable resource in preparing work for CDA tasks, they must acknowledge the source, preferably in the body of the text, and they must not copy and paste paragraphs of work. It is acceptable for a sentence or two (at most) to be used, but quotation marks must be placed around the downloaded material and it should be properly referenced.

The Generic Assessment Grid

Criterion/Mark	0	1-2	3-4	5-6	7-8
Written communication	No work submitted, or language unclear or irrelevant. No attempt to use appropriate scientific terms.	Basic language with some ambiguity or lack of clarity. Little attempt to use appropriate scientific terms.	Basic language with clear meaning but may lack suitable structure. Attempt has been made to use appropriate scientific terms.	Clear language with suitable structure. Correct use of scientific terms.	Clear and concise language which is well structured. Correct use of scientific terms, including relevant terms from glossary
Principal Moderator comments	*At this mark band any work submitted is either very difficult to read or impossible to make sense of.* *The student makes no attempt to use any scientific terminology.*	*At this mark band the language in the report is basic, but with effort the reader can make some sense of it. Areas of the report may be unclear or confusing. Sentence construction is very poor, with little or no punctuation.* *There may be the occasional scientific term in the work, e.g. beaker, thermometer, but it is likely to be misspelt.*	*At this mark band the language may be basic and the structure of the work generally poor, but the meaning is usually clear. There may be some reasonable sentence construction and punctuation.* *The student has attempted to use terms such as beaker, glass rod, thermometer, etc. Most terms are used appropriately and are spelled correctly.*	*At this mark band the work can be clearly understood. Punctuation and grammar are usually good.* *Scientific terminology is generally used correctly, although the words used tend to be straightforward and lacking in complexity.*	*At this mark band the language used is clear and concise. The work is well structured with appropriate use of paragraphs, etc. Punctuation and grammar are very good with few errors.* *All scientific terms in the work are used correctly and appropriate terms from the specification glossary are fully integrated into the report.*

Analysis	No conclusion or attempt to interpret data.	Identify simple patterns and trends in data.	Trends and patterns identified and simple conclusions drawn.	Trends and patterns identified, conclusions drawn and explained using scientific knowledge.	Trends and patterns identified, conclusions drawn and explained using scientific knowledge, consideration of reliability, validity and implication of results.
Principal Moderator comments	*At this mark band there is no attempt to come to a conclusion, or no sense can be made of what has been written.* *There is no attempt to interpret data, or any attempt made is unintelligible.*	*At this mark band students can detect a very simple pattern or trend in data. There may be an attempt to draw a basic conclusion along the lines of "when I did X, Y happened". There may be no attempt at graphical work or numerical analysis. Bar charts or graphs are likely to have been provided by the teacher.* *There is unlikely to be any science used to explain patterns and trends.*	*At this mark band students can detect trends or patterns. For example, the student may have produced (or been given) a simple bar chart from some data obtained, which shows a clear trend. Alternatively, the student may have produced, or been given, a simple line graph which shows a trend.* *Using data obtained / provided, the student can draw simple correct conclusions, possibly attempting to use some scientific*	*At this mark band students will usually produce more detailed pie / bar charts, or reasonable line graphs (or have been given such information). They will be able to identify clear patterns or trends, from which correct conclusions can be drawn. Alternatively, the student may have carried out simple calculations, from which they have drawn conclusions.* *All conclusions will be explained using correct scientific*	*At this mark band students are likely to have produced line graphs which are correct in all respects. (Or they may have been given this information). Some students may have carried out numerical analysis or a very detailed survey, involving perhaps students, adults and commercial organisations. Data will have been analysed at a high level and appropriate conclusions drawn using scientific terminology. The*

			knowledge.	*knowledge.*	*reliability, validity and implications of the data will be fully considered.*
Applications and Implications of science	No argument presented.	An attempt to present an argument for or against applications and implications of the science, but the argument may be irrelevant or inappropriate.	Present argument for or against applications and implications of the science.	Present logical, well-reasoned argument for or against applications and implications of the science.	Present logical, well-reasoned argument for and against applications and implications of the science. Draw substantiated conclusions.
Principal Moderator comments	*At this mark band there is no consideration of the application and implications of the information obtained.*	*At this mark band there is some attempt to argue either for or against the applications and implications of the information obtained, but the argument is either irrelevant to the to the topic under discussion, or it is inappropriate. Some students will present a weak argument both for and against an issue.*	*At this mark band there will be an argument for or against the applications and implications of the issue under consideration. Students may make some attempt to consider the implications of the science on the local community.*	*At this mark band students produce a logical and well-reasoned argument for or against the applications and implications of the science on the community as a whole.* *The argument presented draws on the information obtained, enabling the student to make relevant comments.*	*At this mark band students produce logical and well-reasoned arguments both for and against the applications and implications of the science on the community as a whole.* *The arguments presented draw clearly on the information obtained, enabling the student to make relevant comments and to draw substantiated conclusions.*

Comments on CDAs

Unit 5021 - Biology

'Recycling' was by far the most popular task attempted by students. The 'Stem cell' CDA was not commonly seen by moderators. It was noted that students who attempted the 'Recycling' task did not always use an appropriate level of science knowledge, including words from the glossary, to gain high marks for Written Communication. In a number of cases inaccurate statements were made. For example "recycling prevents global warming which will help repair the hole in the ozone layer". Most students found it easy to argue for and / or against the applications and implications of recycling and it was pleasing to see that their work was often linked to the local community. However, many students did not discuss the scientific implications of particular issues in any great depth.

Unit 5022 - Chemistry

The most popular task was 'Plastics' followed by 'Gold'. Centres are asked to note that in the 'Plastics' task some considerable polymer science, with the correct use of glossary terms, is required to access the highest mark band. Students generally found the 'Gold' task difficult. It is important that the concept of alloying is discussed at an appropriate level in this task. Most students found it easy to argue for the use of gold alloys in jewellery making, but found the counter argument much more difficult.

Unit 5023 – Physics

The most popular task was 'Smoke Alarms' followed by 'Braking Distance'. A scientific explanation of a radioactive decay curve (e.g. americium-241) might be expected to gain high marks for the 'Smoke Alarms' task, which should consider the random nature of radioactive decay. Some students did not include a decay curve or other relevant data in their work, and therefore, found the 'Analysis' section difficult in this task. Most students found it easy to argue for the use of smoke alarms in homes, but found the counter argument much more difficult.

Many questionnaire-based studies were seen in all three areas of GCSE Additional Science, but they tended to be simplistic and did not always generate good quality data that could be discussed effectively. The design of questionnaires / surveys is important if they are to be useful means of collecting information which can be subsequently analysed in depth.

Administration

The annotation of scripts was variable. Centres that annotated work thoroughly to show why marks had been awarded were generally in closer agreement with the moderators' marks. Accurate assessing also invariably occurred when centres made explicit links between the submitted work and the generic assessment grid. This greatly aided the moderation process. Comments such as "WC 3 – basic language but lacks structure", "A 6" and "AIS 8 – substantiated conclusions" written alongside the work at the point of achievement are helpful and make the final judgement as to the overall quality of the work much easier. It is not necessary for teachers to write any more than the examples provided above. Nevertheless, teachers may provide more annotation to support their judgements if they wish. The practice in some Centres is to write a brief summary explaining why particular marks have been awarded for a criterion; this is helpful but should not replace usual methods of annotation.

Some evidence of effective internal standardisation was seen but the Principal Moderators would prefer to see the practice more widespread across Centres. Thorough internal standardisation is likely to identify and clarify the differences between the Centre's teacher-assessors in their

accuracy of applying the assessment criteria and also result in agreement between Centre and moderator being more likely.
In some cases Centres provided excellent information relating to the CDAs submitted, in terms of assignment briefs and relevant information / data sheets. This made it very easy to judge the amount of assistance given to students, and hence made the moderator's job much more straightforward. In situations where students produce a PowerPoint presentation, it would be helpful if Centres could provide additional evidence, where appropriate, to support the marks awarded. This might include comments written by the teacher if a presentation was made to the class, or notes made by the student to go alongside the PowerPoint slides.
A few Centres designed their own tasks and assignment guidance schemes. They are to be congratulated for making the effort to do so. However, the design of these tasks sometimes meant that the assessment criteria could not be applied correctly. The use of the Consultancy service would enable such problems to be identified and dealt with. The 2008 report noted a small number of tasks being set on topics not relevant to the unit being tested. The Principal Moderators are pleased to report that only one such example was noted this year.

Further Support

Consultancy

- Centres are advised to make use of the free consultancy scheme for CDAs. Centres can send up to three marked CDAs to a Principal Moderator in order to receive advice on their standards of assessment. Please refer to the Consultancy booklet for full details.

Tutor support and exemplar materials

The following support and exemplar materials are available on the Science subject page of the Edexcel website:

- "Exemplar centre devised internal assessments with guidance part 2" (November 2007).

- Definitions of Some Useful Scientific Words

Customer service

- Teachers can continue to send in queries and questions via Edexcel's "Ask The Expert" email service. These questions are normally answered within two working days by either the subject advisor at Edexcel, the Chief Examiner, or a Principal Moderator;

- You can also get expert advice on Science by sending your queries to the Science subject advisors by phone on 0844 576 0037 (home), +44 (0)1204 770696 (from outside the UK) or by email to: ScienceSubjectAdvisor@edexcelexperts.co.uk

- Edexcel Science community forum designed to enable you to access peer-to-peer support from fellow Edexcel teaching and delivery staff in schools and colleges. You can obtain an Edexcel online password to use our communities forum, by contacting our online services team on 0844 576 0024.

Training

- In the academic year 2009-10 Edexcel is planning to run training events for CDAs. For further information or to book onto a training event, please visit our website at: www.edexcel.com/training.

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Summer 2009 Examinations

Overview

Edexcel Centre-devised internal Assessment (CDAs) in the extension units count for 30% of the overall marks for the examination. They are an alternative to the one hour extension papers in each of the B3, C3 and P3 units. CDAs in these units are expected to produce work of comparable standard to the alternative written paper.

Centres choosing this option are required to produce portfolios of students' work, totalling 108 marks. The portfolio may be put together in a number of ways, ranging from four separate tasks at 27 marks each, to one single task allowing for up to 108 marks. There are a number of other possible combinations, of course. The maximum marks available for an individual CDA task are 27, 54, 81 or 108, depending upon the amount of specification coverage.

The Principal Moderators are pleased to report that some exemplary work was seen and some Centres produced innovative assignment briefs which fitted in well with the unit(s) being studied. We strongly encourage teachers to develop their own material, possibly using exemplars as a framework and adapting them to make good use of the local environment and to maximise the potential of the students in their Centres. However, as in the first year of this mode of assessment, majority of Centres used the exemplars found in the guidance material provided by Edexcel.

The design of CDA tasks can allow for a range of methods of presentation. The written report was the most popular, but some students explored other methods of presentation, such as booklets, PowerPoint presentations and posters. The standard of ICT skills seen was excellent in many cases.

We were pleased to see that in some Centres the assessment criteria had clearly been shared and discussed with students before assignments had been started. This raised students' awareness of how they should approach their task in order to maximise their performance. Using sub-headings in the design of assignments, such as 'analysis', 'evaluation' or 'suggested improvements' for AO3, to prompt appropriate responses, proved to be a successful strategy in some Centres. This approach is perfectly acceptable as long as students are not given undue assistance.

It is important that there is good coverage of different sections within a topic and that reports are not narrow in their scope if high marks are to be achieved. Practical activities should be clearly integrated into the overall report and not just slotted in as seemingly unrelated sections of work.

Where students use a PowerPoint slide show to support a spoken presentation, the notes they used to help to deliver the presentation to their class should be submitted to the moderator. This might include a print-out of the slides which have been annotated by the student and also by the teacher. Students should acknowledge sources alongside the places where they are used. This could be done by students annotating their printouts of slides afterwards.

Students should be guided to integrate terms from the glossary into their work at appropriate places and not merely provide a list of definitions. It should be apparent in the work of the most able students that glossary terms are clearly understood.

Whilst students are encouraged to use the Internet as a valuable resource in preparing work for CDA tasks, they must acknowledge the source, preferably in the body of the text, and they must not copy and paste paragraphs of work. It is acceptable for a sentence or two (at most) to be used, but quotation marks must be placed around the downloaded material and it should be properly referenced.

The Generic Assessment Grid

Criterion	Students scoring 1, 2 or 3 marks	Students scoring 4, 5 or 6 marks	Students scoring 7, 8 or 9 marks
Knowledge and understanding of science and how science works (AO1)	Show a limited knowledge and understanding of how science works, using a limited range of the concepts, techniques, facts and terminology.	Show a good overall knowledge and understanding of science content and how science works and of the concepts, techniques and facts and terminology.	Show a detailed knowledge and understanding of science content and how science works, encompassing the principal concepts, techniques and fact across all areas of the units and using technical terminology accurately.
Principal Moderator comments	*At this mark level students only show a basic knowledge and understanding of how science works and their reports only include references to a limited number of teaching statements from the specification.* *Students may use some technical terminology, but words might be used inappropriately or be misspelt.*	*At this mark level students show a good knowledge and understanding of how science works and their reports encompass a reasonable number of learning outcomes from the specification.* *Students use a good number of technical terms accurately, i.e. relevant words from the specification glossary relevant to a topic.*	*At this mark level students show knowledge and understanding at the limits of academic demand for the specification. This should cover a wide range of teaching statements from the specification and aspects of how science works.* *Students use a wide range of technical terms accurately, i.e. relevant words from the specification glossary relevant to a topic.*
Application of skills, knowledge and understanding (AO2)	Use and apply knowledge and understanding of simple procedures and concepts in some specific contexts using a limited range of information in an uncritical manner and describe some benefits and drawbacks of scientific developments with which they are familiar.	Use and apply knowledge and understanding in some general situations. Describe how and why decisions about uses of science are made in some familiar contexts and demonstrate a good understanding of the benefits and risks of scientific advances, and identify ethical issues related to these.	Use and apply their knowledge and understanding in a range of tasks and situations. Describe how and why decisions about uses of science are made in contexts familiar to them, and apply this knowledge to unfamiliar situations and demonstrate good understanding of the benefits and risks of scientific advances, and identify ethical issues related to these.

Principal Moderator comments	*At this mark level students discuss the application of the science in their assignment to one or more specific contexts. They show a basic understanding of the positive and negative aspects of the science under discussion.*	*At this mark level students discuss the application of the science in their assignment to school-based and other familiar contexts.* *Students also demonstrate a good understanding of the positive and negative aspects of the science under discussion and consider some ethical issues relating to the science in the task.*	*At this mark level students should be able to discuss the application of the science to the wider world. They should be able to demonstrate that the science in their task can be applied outside school in unfamiliar situations* *Students also demonstrate a good understanding of the positive and negative aspects of the science under discussion and to achieve the highest marks they must fully consider ethical issues relating to the science in the task.*
Practical, enquiry and data-handling skills (AO3)	Identify simple patterns in data gathered from first-hand and/or secondary sources and present evidence as simple tables, charts and graphs, and draw simple conclusions consistent with the evidence they have collected.	Comment on appropriateness of methods used for collecting data, interpret the data appropriately, and undertake some evaluation of their methods and present data in ways appropriate to the context. Draw conclusions consistent with the evidence they have collected and evaluate how strongly their evidence supports these conclusions.	Comment on appropriateness of methods used for collecting data, interpret and question data skilfully, and evaluate the methods used and present data clearly in a manner appropriate to the task. Draw and justify conclusions consistent with the evidence they have collected and suggest improvements to the methods used that would enable them to collect more valid and reliable evidence.

Principal Moderator comments	*At this mark level students can collect some basic primary or secondary data, which may be qualitative or quantitative. They can present their evidence in a range of simple formats and draw simple conclusions which fit the evidence gathered.*	*At this mark level students collect primary or secondary data which may be qualitative or quantitative. They should be able to evaluate the method(s) used to collect the evidence.* *Students should be able to present data in a format appropriate to the task and draw conclusions which fit the evidence gathered. They should be able to comment on the strength of the evidence collected.*	*At this mark level students collect primary or secondary data, which may be qualitative or quantitative. They should be able to thoroughly evaluate the method(s) used in the light of the data obtained.* *Students should be able to manipulate data and present it in an appropriate manner, such as histograms or line graphs. They should be able to understand what information the data provides and draw appropriate conclusions which are supported by scientific knowledge and understanding.* *They should comment on the validity of the technique used to collect evidence and consider aspects of reliability such as the consistency of repeat readings and the trustworthiness of secondary sources.*

Comments on CDAs

Unit B3 (5030) – Biology

The most popular tasks were 'Biotechnology' and 'Behaviour'. Most of the assignments seen by moderators were based on the exemplars provided by Edexcel.

A significant number of questionnaires were generated for studies into diabetes and animal behaviour, but they did not always allow students to develop sophisticated responses in AO3.

In CDAs that focused on anthropomorphism and animal behaviour, a significant number of students presented their personal views. This sometimes resulted in students showing limited knowledge and understanding of the underpinning science. In some Centres students used choice chambers to generate primary data about woodlouse behaviour. Whilst some suitable data was obtained, it did not always result in detailed analysis and evaluation in AO3.

The quality of CDAs on the Biotechnology topic was variable. In some Centres there was more emphasis on diet and its importance in controlling glucose levels than on scientific advances for the treatment of the disease. Students rarely mentioned issues such as how research plays an important role in the diagnosis and treatment of the condition such as the cloning of the Human Insulin Gene and/or the use of Stem Cell research. Students carried out Benedict's tests and cross-referenced their results with the use of Clinistix, or similar test strips, to measure glucose levels. This practical work was usually fairly low level and did not allow students to develop responses which allowed access to high marks in AO3. However, some Centres used colorimeters to analyse the results of tests for glucose using Benedict's solution and this generated useful quantitative data. Many students presented graphs showing how blood glucose and insulin levels changed over a period of time. Some of these were analysed well, but it was difficult for students to evaluate this secondary data.

CDAs on medicinal plants were often fairly basic in their scientific content. Students who included a discussion of purification techniques to extract compounds tended to gain higher marks.

Unit C3 (5040) – Chemistry

The most popular tasks were 'Chemical Detection' and 'Esters'.

The majority of Centres used exemplars from the Edexcel Guidance Booklet part 2, with their students carrying out the "Chemical Detection and Hard Water" task for Topic 1 (marked out of 81) and "Esters" for Topic 2 (marked out of 27). A small number of Centres used four separate tasks, each marked out of 27. Some of these tasks had been designed by the Centres, e.g. 'Fertilizers' and 'Electrolysis and purification of copper' and did not allow students easy access to the full range of marks for each criterion.

Practical work in the chemistry CDAs gave students the opportunity to collect primary data for themselves. This also gave them the opportunity to discuss validity and reliability. Students invariably performed better in Centres where they had been given the opportunity to follow their own lines of enquiry and to extend their work, rather than following prescriptive methods. However, some students did not appreciate the need to use the most appropriate equipment and techniques available for practical work, e.g. the use of burettes to determine the amount of soap solution required to produce a permanent lather.

Unit 5050 – Physics

The most popular tasks were 'Gas Laws', 'PET Scans' and 'Medical Optics'. Much of the work presented fulfilled the specification requirements and the criteria well and there was good evidence that the Edexcel exemplar material had been referred to wisely. However, the quality of work seen, particularly in 'PET scanners' and 'seeing inside the body' was sometimes limited, with little variation from one student to another from a Centre. There was often little evidence at the top end of the mark range that indicated that there was comparable quality of work to that expected from students at the top end of the terminal paper for P3. Some students tended to 'throw in' scientific knowledge without clear aims, whilst neglecting more detail on the key issues, e.g. β^+ particle production and annihilations. Such details are needed in order to obtain the very highest marks. The PET scan task also gives many students difficulty in gaining high marks in AO3 as there is little scope for real data analysis and data interpretation. This could be addressed by experiments or simulations concerning the absorption of gamma rays or the half-life of a radionuclide

The main benefit of PET in identification of tumours was often stated. The risk of radiation affecting DNA and starting tumour growth was sometimes stated. Some students put forward very effective reasoning in terms of the ethical choices that need to be made within a health service provision. For instance, some compared the costs of PET scans with other scanning techniques or alongside what such money could do in terms of treatment, e.g. kidney dialysis.

Administration

The quality of annotation varied from Centre to Centre. Some excellent practice was seen where teachers had annotated work at the point of achievement, using quotes from the assessment criteria. However, such practice was not widespread and moderators had to spend a considerable amount of time looking for marks which the centre had awarded. Centres are reminded that internally assessed work should be annotated using minimalist notation such as "AO1 8 – detailed knowledge and understanding" and "AO3 6 – methods evaluated, conclusions drawn" at the point of achievement in the work. Any additional detail as to reasons for the award of marks is optional and at the Centre's discretion, but very helpful to moderators. Providing a summary sheet for each student is helpful to get an overall picture of teachers' assessments, but does not help with moderation when it comes to individual marking points.

Evidence of effective internal standardisation was variable. In some cases the only evidence that internal adjustments had been made was by the crossing out of the original teacher's marks. It would have assisted moderation if an explanation for their differing awards had been made at the point of reference in the body of the text. Careful internal standardisation is likely to identify and clarify the differences between teachers within a Centre in terms of how accurately the assessment criteria are being applied. This should also make agreement between Centre and moderator more likely.

In some cases Centres provided excellent information relating to the CDAs submitted, in terms of assignment briefs and relevant information sheets. This made it very easy to judge the amount of assistance given to students, and hence made the moderator's job much more straightforward. In situations where students produce a PowerPoint presentation, it would be helpful if Centres could provide additional evidence, where appropriate, to support the marks awarded. This might include comments written by the teacher if a presentation was made to the class, or notes made by the student to go alongside the PowerPoint slides.

A few Centres designed their own tasks and assignment mark schemes. They are to be congratulated for making the effort to do so. However, the design of these tasks sometimes meant that the assessment criteria could not be applied correctly, or that a particular criterion was not fully addressed. Tightly controlling the structure students' reports through rigid assignment briefs limits the opportunity for students to explore open-ended problems. It is also essential that Centre-devised assessments fit in with the Topics being studied and are not beyond the scope of the specification. The use of the Consultancy service would enable such problems to be identified and dealt with.

Further Support

Consultancy

- Centres are advised to make use of the free consultancy scheme for CDAs. Centres can send up to three marked CDAs to a Principal Moderator in order to receive advice on their standards of assessment. Please refer to the Consultancy booklet for full details.

Tutor support and exemplar materials

The following support and exemplar materials are available on the Science subject page of the Edexcel website:

- "Exemplar centre devised internal assessments with guidance part 2" (November 2007).
- Definitions of Some Useful Scientific Words

Customer service

- Teachers can continue to send in queries and questions via Edexcel's "Ask The Expert" email service. These questions are normally answered within two working days by either the subject advisor at Edexcel, the Chief Examiner, or a Principal Moderator;

- You can also get expert advice on Science by sending your queries to the Science subject advisors by phone on 0844 576 0037 (home), +44 (0)1204 770696 (from outside the UK) or by email to: ScienceSubjectAdvisor@edexcelexperts.co.uk

- Edexcel Science community forum designed to enable you to access peer-to-peer support from fellow Edexcel teaching and delivery staff in schools and colleges. You can obtain an Edexcel online password to use our communities forum, by contacting our online services team on 0844 576 0024.

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Training

- In the academic year 2009-10 Edexcel is planning to run training events for CDAs. For further information or to book onto a training event, please visit our website at: www.edexcel.com/training.

Grade Boundaries

Edexcel Devised Internal Assessment Units

Raw Mark Grade Boundaries

5001
5011
5024
5034
5044

Max mark	A*	A	B	C	D	E	F	G
18	16	14	12	11	9	7	5	3

5002
5003
5004
5012
5013
5014

Max mark	A*	A	B	C	D	E	F	G
36	32	28	24	21	17	13	10	7

Uniform Mark Grade Boundaries - All Units

Max UMS	A*	A	B	C	D	E	F	G
40	36	32	28	24	20	16	12	8

Grade Boundaries

Centre Devised Internal Assessment Units

Additional Science

Raw Mark Grade Boundaries

5021
5022
5023

Max mark	A*	A	B	C	D	E	F	G
24	22	20	18	16	13	11	9	7

Uniform Mark Grade Boundaries for these units

Max UMS	A*	A	B	C	D	E	F	G
40	36	32	28	24	20	16	12	8

Biology, Chemistry and Physics Extension Units

Raw Mark Grade Boundaries

5030
5040
5050

Max mark	A*	A	B	C	D	E	F	G
108	88	78	68	58	48	38	28	18

Uniform Mark Grade Boundaries for these units

Max UMS	A*	A	B	C	D	E	F	G
120	108	96	84	72	60	48	36	24

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