



Centre Assessed Unit

Information for Centres & Marking Guidance for Tasks

2009/2010

Issue No. 4

Core Science	
Specification A	4461
Specification B	4462
Additional Science	4463
Biology	4411
Chemistry	4421
Physics	4451

Coursework Deadline
7th May 2010

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Dr Michael Cresswell, Director General.



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1. General Information

Key Dates	
Centre Assessed Unit Entries to be with AQA	21 February 2010
June Written Paper and Certification Codes	21 March 2010
Centres receive all Centre Mark Forms and moderator address labels	March/April 2010
CAU deadline	7 May 2010
Results published	26 August 2010
Last date for Enquiries After Results	20 September 2010

Contact Points at AQA	
<i>For all subject and specification queries contact the Subject Officer</i> Susanna Piszczynska, AQA, Stag Hill House, Guildford, Surrey GU2 7XJ	Tel: 01483 477757/ 8 spiszczyńska@aqa.org.uk
<i>To obtain publications contact:</i> AQA Logistics Centre (Manchester), Unit 2, Wheel Forge Way, Ashburton Park, Trafford Park, Manchester M17 1EH	Tel: 0870 410 1036 Fax: 0161 953 1177 email: publications@aqa.org.uk
<i>For enquiries about entries contact:</i>	entries@aqa.org.uk
<i>For key dates, administrative procedures, etc</i>	check the AQA website (www.aqa.org.uk)

The ISAs valid for candidates to **complete** September 2009 to July 2010 this year are:

Set 3		
B1.4 – Caffeine	C1.5 – Investigating Plastics	P1.4 – Keeping Warm
B2.3 – Diffusion	C2.3 – Investigating Catalysts	P2.3 – Momentum
B3.3 – Yeast	C3.3 – Investigating Acidity	P3.3 – Electromagnets

Set 4		
B1.5 – Killing Microorganisms	C1.6 – Investigating the properties of Oils	P1.5 – Solar Cells
B2.4 – Staying Cool	C2.4 – Investigating energy changes	P2.4 - Thermistors
B3.4 - Yoghurt	C3.4 - Investigating Solubility	P3.4 - Cantilevers

2. Centre Assessed Unit (CAU) Administration 2008/2009

<p>Entries for CAU Unit to be with AQA</p> <p>21 February 2010</p>	<p>Please remember that you must submit entries for the centre-assessed unit as well as the examined units if you wish to certificate.</p> <p>Failure to do so is one of the main causes for delay in moderation.</p> <p>This is a different date to the Objective tests and Written Tests.</p>
<p>Marks for centre-assessed units to be with AQA and assigned moderator</p>	<p style="text-align: center;">7 May 2010</p>
<p>Preparation for moderation</p>	<ul style="list-style-type: none"> • All the work must be ready for the moderator on 7 May, with no further annotation or other work remaining to be done when the sample request arrives. • Candidate Record Forms for all candidates should be filled in and signed by all the candidates before the sample request arrives. • The Centre Declaration Sheet should be completed and ready to send with the sample. • Ensure you have added ISA and PSA for the CAU Mark
<p>What to send to AQA by 7 May</p>	<ul style="list-style-type: none"> • The top copy of the Centre Mark Form(s) (CMF) or the EDI submission, showing the marks of all candidates. • N.B. You will receive a separate set of CMFs for each subject.
<p>What to send to the moderator by 7 May</p>	<p>First check how many CAUs you are submitting for moderation IN TOTAL, i.e. for all subjects added together. Then:</p> <ul style="list-style-type: none"> • If you have more than 20 entries for a CAU, send the pink and yellow copies of the Centre Mark Form(s) (or two copies of the EDI Printout) showing the marks for all candidates. Your moderator will contact you to tell you the names of the candidates whose work they wish you to send. • If you have 20 or fewer entries for a CAU, send the work of all candidates, together with all the Centre Mark Forms. • The work of a candidate consists of: <ul style="list-style-type: none"> ○ The ISA, with tables and graphs or bar charts stapled to it ○ An ISA explanation sheet ○ Copies of any printed instructions issued • Remember to send the completed Centre Declaration Sheet. • Please circle the highest and lowest non-zero mark gained by your candidates (across all the ISAs / subjects you are entering) on your Centre mark forms and ensure that both are included in the sample. If the lowest score is only PSA, please include a CRF with your annotation to that effect. In this case the CRF need not be signed by the candidate but MUST be signed by the teacher. • The ISA script and work of each candidate must be accompanied by a Candidate Record Form, signed by the candidate and the teacher.
<p>What to do if you have not received moderator details by 1 May</p> <p>Contact Entries (see page 3) to ensure that AQA has received entries for your candidates for the Centre Assessed units:</p>	
<p>Where to find forms for 2010 http://www.aqa.org.uk/admin/p_course.php</p> <p>Other information for centres (CAU form codes/lost coursework/private candidates etc)</p> <p>Candidate Record Forms http://www.aqa.org.uk/admin/crf_gcse_2009.php</p> <p>Centre Declaration Sheets http://www.aqa.org.uk/admin/p_course_cds_2009.php</p>	

3. CAU Advisers

<p><i>CAU Adviser details</i></p>	<ul style="list-style-type: none"> • All centres registered with AQA for the specification will be allocated a CAU Adviser. Centres are advised early in the autumn term of each year of the details of their Adviser for that year. Please note that a centre’s Adviser for one academic year may not be the same person the next year, and will not be the same as their moderator • Teachers who do not know the details of their CAU Adviser should contact the Subject Department (see page 3). • When you contact your CAU Adviser, please give them your centre number, and be very clear as to the specification to which your query applies.
<p><i>What can a CAU Adviser do?</i></p>	<p>Your CAU Adviser can:</p> <ul style="list-style-type: none"> • advise on ISAs, mainly by telephone or e-mail. • say whether or not suggested methods of investigation are suitable – eg whether they cover the ISA topic • suggest other methods of investigation that may be suitable. • advise on how to carry out investigations in practical situations. This could include problems of organisation as well as those of supervision. • advise on internal moderation procedures. It often turns out that problems concerning summer moderation can be traced back to poor or non-existent internal moderation. Centres should use published exemplar material to ensure that all teachers at the centre are marking to the same standard. • give advice on the interpretation and application of the marking guidelines • confirm the arrangements for preparing material for the moderator.
<p><i>What can a CAU Adviser not do?</i></p>	<p>There are some matters that are outside the remit of a CAU Adviser, and they may politely decline if requested.</p> <ul style="list-style-type: none"> • CAU Advisers can not allocate marks for ISAs. They will not pre-judge what the moderator will decide: doing so could lead to conflict with the moderator’s judgement. • Except in rare circumstances, CAU Advisers do not look at examples of candidates’ work – primarily for the reason stated above. • CAU Advisers will not give opinions on work previously submitted for moderation, or on feedback forms after results have been issued. They can only advise on work not yet submitted for an examination. If you have queries or complaints about the moderation of work you should use AQA’s Enquiry After Results service. • CAU Advisers will not normally go into a centre to discuss ISAs issues. • If your centre has difficulty contacting the CAU Adviser, please use the email. Make sure to quote your Centre name and Number

4. CAU Issues: General

<p><i>What resources are available from AQA?</i></p>	<p>The resources can be found and downloaded from the Support Material folder found in KEY MATERIALS in the subject specific areas.</p> <p>Resources for CAU include:</p> <p>The current Teachers' Guide, Schemes of Work, The Teachers' Notes, Updated specimen ISAs and mark guidelines are on the website http://web.aqa.org.uk/qual/newgcseesscience.php?id=03&prev=</p>
<p><i>Why is annotation of candidates' work so important?</i></p>	<ul style="list-style-type: none"> • Clear annotation helps the moderator see where and why you have given certain marks, why and how you have used compensatory marking. Your moderator wants to be able to agree your marking – comprehensive annotation on the work will make it much easier for them to do so. • Please follow the marking instructions so that the scripts have one tick for one mark and subtotals in the margin. • Do include copies of any worksheets, prompt sheets or instructions that you have issued to candidates.
<p><i>How should CAUs be presented to the moderator?</i></p>	<p>Every summer, moderators spend huge amounts of time trying to sort out the work they have received from centres that have not presented the work clearly. Following the guidelines below will help the moderators immensely.</p> <ul style="list-style-type: none"> • Do not supply work in plastic folders. Use Treasury Tags or staple the table(s) of results and graphs or bar charts to the back of the ISA. • Ensure that the Centre Number and Candidate number is on the ISA Script and the candidate's name is on every sheet used for drawing tables or graphs . • Please organise work so that the moderator can easily identify which work belongs to which candidate. • Remember to get your candidates to sign their Candidate Record Forms, and attach the appropriate form firmly to each CAU. • Send the material by first class post only. Delays occur when moderators have to make special trips to the sorting office to collect or sign for parcels. • Please ensure that sufficient postage has been used, as incorrect postage may cause delays to delivery.
<p><i>Filling in the Candidate Record Form</i></p>	<p>The correct version of the Candidate Record Form should be completed and attached to each candidate's CAUs by 7 May so that there is no delay once the moderator has called for the sample. CRF's are a QCA requirement and if not produced the candidate will not gain any marks for the Centre Assessed Unit. The CRF form can be found on the website at: http://www.aqa.org.uk/admin/crf_gcse_2010.php</p> <p>For each one, please check that:</p> <ul style="list-style-type: none"> • the candidate has completed and signed the declaration to authenticate the work as his or her own • the marks are recorded accurately and clearly, and the arithmetic is correct • the centre has included both the PSA and the ISA mark on the CRF • the candidate's total mark on the CRF is identical to the mark recorded on the Centre Mark Form which was sent to AQA on or before 7th May 2010 <p>If the CRF is not supplied or has not been signed, you will be contacted. The candidate may not receive a mark for the CAU Unit if no CRF is sent to AQA.</p>

5. Instructions concerning ISAs for GCSE sciences 4460

5.1 Security of materials

- Copies of ISAs and associated Marking Guidelines **must be kept under secure conditions at all times**. They should **not** be put on any Centre Intranet.
- The Examinations Officer may print off one copy of each ISA and the associated Marking Guidelines for reference by the appropriate Head of Department.
- When an ISA is required for use with a group of candidates, only the number sufficient for that group should be printed.
- Completed ISAs must **not** be returned to candidates – they **must** be kept under secure conditions. They should be disposed of as confidential material and shredded or burned.

5.2 Submission of marks

1 To AQA by 7th May:

- The top copy of the completed Centre Mark Form (CMF) or EDI file.

2 To the Moderator by 7th May:

(a) Centre with more than 20 candidates IN TOTAL (i.e. for all science subjects added together):

- Pink and yellow copies of the CMF or two copies of EDI files. **Circle the number of the top-scoring candidate and the lowest non-zero scoring candidate on each CMF.** Remember that the sample covers ALL of the science subjects for which you are entering candidates (SCYC, ASCC, BLYC, CHYC and PHYC). Therefore you should send the pink and yellow copies for all the subjects together, even if you have fewer than 20 candidates for one of them.
- Centre Declaration Sheet signed by the Head of Centre
- It is a great help if the centre can provide a rank order spreadsheet (order of CAU score) for all candidates with their CAU Entry Code. (An example of a rank order spreadsheet can be found in this booklet). As the moderator will be moderating a centre rather than separate subjects – this provision will enable a sample to be chosen far more accurately.

The Moderator will then request a sample.

The yellow copy of the CMS will be returned marked with the sample required.

The centre will need to send the annotated ISAs to the moderator within 5 working days, preferably by return of first class post.

If the moderator has inadvertently missed the top mark or the lowest mark – please ensure that these are added to the sample

(b) Centre with 20 candidates or fewer in total:

- Pink and yellow copies of the CMF or two copies of the EDI files.
- The work of **all candidates** with the Candidate Record Forms (CRF) attached, signed by the candidate and the teacher
- Centre Declaration Sheet signed by the Head of Centre.

When sending the ISAs to the moderator remember that, however many candidates you have, you must include any Private candidates/ EDE candidates or PAR candidates (candidates whose parents have taught in the school) IN ADDITION to the normal sample.

Do not use Parcel Force or Recorded Delivery.

Please send the material by first class post only. Delays occur when moderators have to make special trips to the sorting office to collect or sign for parcels. Please ensure that sufficient postage has been used, as incorrect postage may cause delays to delivery. Also ensure that you have a completed Proof of Postage.

The centre should send to the Moderator the completed ISA for each candidate in the sample. The following must be included with each sample ISA:

- the completed ISA Explanation Sheet for the activity undertaken by the candidate
- a copy of altered marking guidelines (if appropriate)
- a work sheet (if one has been used)
- the tables, graphs and charts and the CRF, firmly attached to the ISA question paper using a treasury tag or a staple. Please do **NOT** use plastic wallets.

The Candidate Record Form and the ISA question paper must be signed by both the candidate and the teacher.

Further guidance may be found in the Teachers' Guide.

6. The Practical Skills Assessment (PSA)

6.1 Conducting the PSA

PSAs are based on 'can-do' criteria and can take place throughout the course when the candidate is carrying out practical activities. Teachers have found it sensible to target just one or two candidates at a time. The final mark out of 6 should represent the typical achievement for that candidate by the end of the course.

6.2 Using PSAs in a Formative Way/Negotiated Profiles

Candidates can be told their PSA mark so that they can try to improve it. The teacher should discuss with the candidates the way in which the improvement can be made, ie what aspect of their current performance is not meeting the criteria for the higher marks. It is reasonable to expect an improvement in the candidates' skill level as they proceed through the course and appreciate that the marks gained in a PSA will go towards their overall assessment and hence will affect their final grade for the subject.

6.3 How to Submit the Final PSA Mark

The final PSA mark is determined by the teacher on the basis of the practical work that the candidate has carried out over the course. The PSA mark is recorded on the Candidate Record Form underneath the ISA mark. The ISA mark and the PSA mark are added together to give the total mark that will be submitted to AQA. There is space on the Candidate Record Form to write a comment about the candidate's PSA if it is thought to be appropriate.

CRITERIA FOR THE PRACTICAL SKILLS ASSESSMENT

How to Apply the Criteria

The teacher should use these criteria to ensure that the candidates:

- use apparatus and materials in an appropriate and careful way
- carry out work in a methodical and organised way

Work with due regard for safety and with appropriate consideration for the well-being of living organisms and the environment. The descriptors for the Practical Skills Assessment are hierarchical so that both descriptors at a particular performance level must be matched before descriptors at the next higher level can be considered. If only one of the descriptors at a particular mark performance level is matched, then an intermediate mark of 1, 3 or 5 can be awarded.

At each of the marks (2, 4 and 6) there are two bullet points. If neither of the bullet points for 2 marks is matched, the candidate should be awarded zero marks. If either of the bullet points for 2 marks is matched, the candidate scores 1 mark. If both bullet points for 2 marks are matched, the candidate scores 2 marks.

Once 2 marks have been awarded, consideration may be given to the two bullet points for 4 marks: matching either one allows 3 marks to be awarded; matching both results in 4 marks. Similarly, once 4 marks have been gained, consideration may be given to the two bullet points for 6 marks, in order to determine whether the candidate should be awarded 5 or 6 marks.

PERFORMANCE LEVEL & SKILL DESCRIPTORS

Awarding Marks for Techniques/Equipment

This section illustrates the types of skill that teachers should expect candidates to demonstrate in order to be able to access the various marks in the PSA range.

2 marks	<p><i>Practical work is conducted:</i> safely, but with help to work in an organised manner.</p> <p><i>The candidate:</i> uses the apparatus with assistance.</p>	<p><u><i>Safety</i></u> Candidates should: carry out practical work safely with safety glasses worn at all appropriate times, wear disposable gloves when handling dangerous chemicals, tie hair back and wear protective clothing when appropriate. Candidates may need frequent reminders to follow these instructions.</p> <p><u><i>Using equipment</i></u> Candidates should: be able to use simple equipment (eg heating equipment, glassware, power supplies) and simple measuring devices (eg rulers, thermometers, digital meters). They may need assistance to assemble the equipment or to take readings from measuring devices.</p>
4 marks	<p><i>Practical work is conducted:</i> safely and in a reasonably organised manner.</p> <p><i>The candidate:</i> uses the apparatus skilfully and without the need for assistance.</p>	<p><u><i>Safety</i></u> Candidates should: Carry out practical work safely with safety glasses worn at all appropriate times, wear disposable gloves when handling dangerous chemicals, tie hair back and wear protective clothing when appropriate. Candidates may need occasional reminders to follow these instructions.</p> <p><u><i>Using equipment</i></u> Candidates should:</p> <ul style="list-style-type: none"> • take measurements to an appropriate level of accuracy (eg where an instrument shows a large number of digits, the candidate records a reading with the correct number of significant figures or decimal places). Candidates should be able to do this without assistance • work consistently to their final planned method • take care to reduce the number of likely sources of error • present the data collected in a suitable neat table with all of the headings and units shown while the work is in progress.

<p style="text-align: center;">6 marks</p>	<p><i>Practical work is conducted: safely and in a well-organised manner.</i></p> <p><i>The candidate: uses the apparatus skilfully in a demanding context.</i></p>	<p><i>Safety</i></p> <p>Candidates should:</p> <ul style="list-style-type: none"> • Without being reminded, carry out practical work safely with safety glasses worn at all appropriate times, wear disposable gloves when handling dangerous chemicals, tie hair back and wear protective clothing when appropriate • Show a high degree of organisation when carrying out the practical work. This will be seen as an organised workspace with the apparatus arranged in a consistent and planned way and all containers of solutions and solids correctly labelled. <p><i>Using equipment</i></p> <p>Candidates should:</p> <ul style="list-style-type: none"> • Demonstrate competence with a range of equipment, some of which is quite complex • Use the apparatus skilfully in a demanding context. • These last two bullet points may be exemplified by the following • Make up their own solutions of their chosen concentrations rather than being given them. This could be done by diluting a stock solution collecting and then measuring the volume of a gas rather than counting bubbles taking readings from a changing system rather than a fixed system (eg in a rate of reaction experiment there are two ways in which the volume of a gas can be measured over 10 minutes. The volume can be measured every 30 seconds for 10 minutes, ie a changing system, or the volume of gas may be measured once at 10 minutes, ie a fixed system) • Carrying out an experiment where two instruments need to be read simultaneously rather than only one instrument (eg in a resistance of a wire experiment, the resistance of a length of wire can be measured by simultaneously using an ammeter and a voltmeter, ie two instruments, or by using an ohmmeter to measure the resistance directly, ie one instrument) • Carrying out an experiment that needs careful attention to detail to make sure that meaningful results can be obtained (eg in an experiment where living systems are involved, ie photosynthesis or yeast, the candidate will need to get a number of factors correct to get measurable readings) controlling or monitoring the variables in an experiment that has a number of variables that could affect the results (eg in a rate of reaction experiment, the rate is affected by temperature, concentration of solutions and surface area of solids. The candidate will need to control or monitor all of the variables except the independent variable. Often, the temperature can only be monitored rather than controlled such as in exothermic conditions).
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7. Marking the ISA tests

There are four distinct parts to be marked in the ISA.

1. **the table for the results**
2. **the graph or bar chart**
3. **Section 1 of the ISA test**
4. **Section 2 of the ISA test.**

7.1 The Table for the Results

Each candidate must draw up, individually, his or her own blank table ready for the insertion of the collected data. This table must be completed, and marked, before starting on the practical activities.

If a candidate is unable to draw up such a table, then the teacher may issue one to the candidate. If this was the case either or both of the marks allocated to the table would be unavailable to that candidate. In such cases, the teacher must annotate the script to show that the candidate had been provided with a partial or complete table ready for the results.

In some cases, eg field studies, the teacher may decide that a set of class results is needed in order to be able to see a pattern, eg the teacher may use the white board to collect marks from the whole class and print a results table from that. If this is done, then both the class results table and the individual candidate's blank table should be attached to the ISA.

This should be marked as soon as possible after the candidates have completed it, and in any case before the candidates carry out the practical work.

The reason for marking the table at this stage is to avoid candidates copying from each other while carrying out the practical activities.

There are two things that you need to look for when marking the table:-

1. Will the table be able to accommodate all the necessary data?
2. Do all the columns and rows have the correct headings **and** units?

Note that it is not necessary for candidates to include columns for repeats, means or derived values. You may wish them to include such columns as good practice, but as there are no marks allocated to such columns, candidates will not lose any marks if they do not include them.

Once you have decided upon these marks (0, 1 or 2) it will not matter if the candidate subsequently changes his or her table - these marks will have been "banked" with you.

Marking the table at this stage has two further benefits:

1. If you have a candidate who is unable to draw up a blank table, you may give them one. They will not be awarded any marks for the table, but it will allow them to progress to the next stage.
2. If you are carrying out an investigation that requires the whole class to pool results together, eg a fieldwork investigation, then you may draw a large table on the board and ask candidates to enter their data into it. Because you have already marked their blank tables, you will not be 'giving the game away' by revealing the structure of the table at this stage.

You must use your professional judgement as to whether or not you disclose the marks that you have awarded to the candidate. Some may be demoralised by seeing that they have scored zero at this stage. However, you must at least keep your own private record of the marks awarded.

The following table gives some extra guidance on how to award marks.

Question	Answer	Additional guidance	Marks
	<p>Table:</p> <p>Correct headings AND units all correct for all measured variables</p> <p>Table with incomplete headings or units for the measured variables = 1 mark</p>	<p>eg: all headings present = 1 mark</p> <p>eg: all units present = 1 mark</p> <p>As a ‘rule of thumb’, add up the total number of headings and units that should be present, then:</p> <ul style="list-style-type: none"> • all present and correct = 2 marks • some missing, but at least half present and correct = 1 mark <p>fewer than half present and correct = 0 marks</p>	2 marks

7.2 The Graph or Bar Chart

When the candidates have completed the practical part of the investigation, they should be asked to draw a chart of graph to display their results. This should be done, on their own, under your direct supervision.

This part of the work may be awarded up to four marks. The following table shows how these should be awarded.

Question	Answer	Additional guidance	Marks
	<p>Graph:</p> <ul style="list-style-type: none"> • X axis: suitable scales chosen and labelled with quantity and units • Y axis: suitable scales chosen and labelled with quantity and units • Points or bars plotted correctly to within ± 1 mm • Suitable line drawn on graph or bars correctly labelled on bar chart 	<p>Accept axes reversed</p> <p>It may not always be necessary to show the origin</p> <p>Scale should be such that the plots occupy at least one third of each axis</p> <p>Allow one plotting error out of each 5 points plotted</p> <p>Allow error carried forward from incorrect points</p> <p>If wrong type of graph/chart, maximum 3 marks</p> <p>If the independent variable is:</p> <ul style="list-style-type: none"> • <i>continuous</i>, should draw a <i>best fit line graph</i>. <p>N.B. If no line possible because there is no correlation, candidates should state this on the graph to gain the mark</p> <ul style="list-style-type: none"> • <i>categoric</i>, should draw a <i>bar chart</i> • <i>discrete</i>, you may allow either a bar chart or a line graph 	<p>1 mark</p> <p>1 mark</p> <p>1 mark</p> <p>1 mark</p>

Candidates must be allowed to make their own decision as to the most appropriate form of chart or graph, eg pie chart, bar chart, line graph, scattergram. However, if they make the wrong choice, they should be penalised one mark (the first bullet point mark in the list above). You may discuss the choice at the open discussion stage before the practical session is started, but you should not give the candidates any advice at his stage.

In GCSE Science AQA has always said that a Line of Best fit is the best method rather than dot to dot lines for all occasions in all three sciences. The new ISAs are no different. Candidates should draw a line of best fit - it also is confusing for GCSE candidates to have a rule in biology which is not continued in Chemistry and Physics where LOBF are the norm. We have always taken the view that in biological experiments a LOBF is better but that the candidates should not be penalised if, in the professional opinion of the teacher and in that particular case, the joining of dot-to-dot is appropriate. Please annotate your work to that effect if this is the case.

7.3 Section 1 of the ISA test

This is the section that deals with questions referring to the candidate's own investigation. The *quality* of the data collected is not being judged - the questions deal with the manner in which it has been collected and the analysis of the data.

One of the first questions in this section will often ask, "What were you trying to find out?"

It is important that the candidate answers in a clear and definite manner. They need to state the independent and dependent variable clearly, although they do not need to use these terms. Thus "I was trying to find out about photosynthesis" would not be worthy of any marks, but "I was trying to find out if altering the light intensity affected the rate of photosynthesis" would earn 2 marks.

Many of the questions on Section 1 of the ISA will need you to refer to *that particular candidate's results*. Different candidates in the group may well have different, but perfectly valid answers, dependent upon their data. For example, if asked, "Did you get any anomalous results", one candidate may correctly answer, "Yes" whilst another may correctly answer "No". You will need to inspect their results in order to determine whether they deserve a mark. Questions like this will often be set out in the form:-

Did you get any anomalous results?	Yes / No
Draw a ring around your answer.	
Give a reason for your answer.	

There are no marks for simply choosing "Yes" or "No"; the mark(s) is always for the reason.

The last question of section 1 will always be:-

Make sure that your results tables, and charts or graphs are handed in with this paper. You will be awarded up to 6 marks for these.
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You will need to record the marks for the table (maximum 2) and the graph/chart (maximum 4) in the margin at this point. Please record these two numbers separately.

7.4 Section 2 of the ISA test.

This part of the test asks questions about new data that the candidates are given in the same topic area as that of their investigation.

Please note that, following an Ofqual scrutiny of the science specifications last year, AQA has made an adjustment to the assessment of the ISA papers. The Set 4 ISAs, valid from September 2009 require candidates to use data and experience from their own investigations in order to answer some of the questions in Section 2 of the ISA.

Consequently:

- Centres should ensure that candidates complete the practical before attempting the ISA.
- As far as possible centres should use tasks **very similar** to the ones detailed in the Teachers' Notes.

7.5 How to mark the ISAs

Please mark in red ink, and use one tick for one mark. Each part of each question must show some red ink to indicate that it has been seen.

Subtotals for each part of each question should be written in the right-hand margin, i.e. wherever the mark allocation such as (*1 mark*) appears on the script, a subtotal should be written in the margin at that point.

At the end of each of the two Sections, there is a rectangular box in the right-hand margin, eg

— 18

You need to write the total for the section in this box.

Enter the marks for **Section 1** and **Section 2** and the **total mark** on the front cover of the answer booklet. Then also write the **total** mark in the box in the top right-hand corner of the front page, which is labelled 'leave blank'.

The teacher must sign and date the front cover of the ISA.

The papers must be kept in a secure place and must **not** be returned to the candidates.

7.6 Filling in the ISA Explanation Sheet

If, with a particular set of candidates, you have changed anything about the way in which the investigation has been carried out, it is important that you tell the moderator what has changed. You will need to send the moderator any worksheet that you have given to the candidates and also an amended marking guideline so that the moderator will be able to understand your change of marking.

The moderator will require **one** ISA explanation sheet for each **different** way in which the investigation has been carried out at the centre. If more than one ISA explanation sheet is submitted for any one investigation, you should note down on the sheet the numbers of the candidates who carried it out in that particular way.

It would be good practice if, every time an ISA is completed by a class, the teacher prepares the Explanation sheet and any other information which is kept in the pack with the marked ISAs ready for inclusion with the sampled work should a piece from that set be chosen.

7.7 Making Judgements

One of the difficulties that you will face in marking the ISAs concerns the wide variety of ways in which a candidate may respond to a particular question. In many cases you may wish that there were more marks available so that you could award the maximum for a "perfect" answer, and fewer for an answer that partially addresses the question. However, in many cases there is only one mark available, and you will be left pondering "Do I award the candidate this mark, or not?". You must not award half marks. The following strategy may help you to overcome such difficulties:

- If you find yourself genuinely undecided as to whether or not the candidate deserves the mark, give the benefit of the doubt on the first occasion that you meet such a dilemma on a candidate's script. Put a tick on the answer, but also write a capital "D" by the tick. This will indicate to the moderator that you have given serious consideration to the answer, have realised that it is a marginal decision, and have on this occasion given the benefit of the doubt to the candidate.
- On the next occasion that you meet such a dilemma *on that same candidate's script*, you do not give the benefit of the doubt. You should mark the answer with a cross, again putting a capital "D" by the cross.
- Continue through the script in this manner, **alternating** between "✓ D" and "× D". In this way the candidate will be given the benefit of the doubt in approximately 50% of the cases of doubt. It will also indicate to the moderator that you have realised that there is genuine doubt as to whether or not the candidate deserves the mark.

Please do not overuse this device, but you should find it useful on occasions.

7.8 Annotation

Although you were present when the candidates carried out the investigation and completed the ISA test, please bear in mind that the moderator was not. All that the moderator has, in order to make judgements, is the paperwork that you send. For this reason, **annotation is most important** and is a requirement under the QCA Code of Practice. If there are any occasions on which it may not be clear to the moderator why you have or have not awarded a mark, you should add a brief note to the candidate's script. It is also helpful to include the worksheet if one was supplied, or put a few explanatory notes on the ISA Explanation sheet which must accompany each ISA in the sample.

8. The moderation process

Moderators look at a sample of a centre's work. Their job is not to re-mark every single piece of work from every candidate, but rather to judge whether a centre has been fair and reasonable in the way in which it has applied the Marking Guidelines.

The moderator will look at the work in the sample and decide whether they agree with the centre mark. Moderators work to a tolerance of ± 2 marks out of the 34; in other words, if all of the moderator's marks for the total for a candidate are within ± 2 marks of the centre's marks, the centre will be judged to have been marking to an acceptable standard. If the total for one or more candidates exceeds this tolerance, then the marks for the centre may have to be adjusted.

The moderator will complete a feedback form which you will receive from AQA shortly after the publication of the results.

9. **Principal Moderator's Report 2009** **Science Centre Assessed Unit** **SCYC/ASCC/BLYC/CHYC/PHYC**

General

This report covers the third submission for moderation of the coursework for the new specifications in GCSE Science. Because of the confidential nature of the ISAs, which are still currently operational, it cannot deal with specific references to particular ISAs, but rather deals with the overall general performance of the component this year. Centres that have particular questions about specific ISAs should make enquiries of their Centre Assessed Unit Adviser.

1. General Structure of the Centre Assessed Unit

The total number of raw score marks for the CAU is 40. This comprises 6 marks from the PSA and 34 marks from the ISA.

The ISAs may be used for more than one subject. Six were available in the first year of the specification, and these could be used for moderation this year providing that that had been completed prior to May 5th 2008. A second set of 16 ISAs was issued in September 2007 and a third set of 9 ISAs was issued in September 2008. All of the Set 2 and Set 3 ISAs were available for moderation this year.

Moderation is only carried out once per year. Requests for moderation should be submitted by February 21st each year, using the appropriate code:

- Science A/B - SCYC - one ISA from B1, C1 or P1
- Additional Science - ASCC - one ISA from B2, C2 or P2
- Biology - BLYC - one ISA from B1, B2 or B3
- Chemistry - CHYC - one ISA from C1, C2 or C3
- Physics - PHYC - one ISA from P1, P2 or P3

Centres may also request that the marks for this component are carried forward from one subject to another appropriate subject. For example, if a candidate has previously submitted an ISA in B1 for moderation for Science, this mark may be carried forward for subsequent certification in Biology.

If a centre wishes to transfer the ISA to a different subject after making the initial entry in February, this may be done without charge up to April 26th.

Marks must be submitted by May 7th each year. It is the total mark out of 40 (i.e. PSA plus ISA) that must be entered on the Centre Mark Form.

2. Practical Skills Assessment (PSA)

Candidates carry out a practical investigation based on one of the ISAs set by AQA.

The criteria for the award of these 6 marks are based on 6 "Can-do" statements. These may be assessed at any time during the course when candidates are carrying out practical work. The mark should represent the typical achievement of the candidate by the end of the course.

Centres are not required to submit any records or justification for their arrival at the final mark, as this component is not moderated. The intention is that the component should be formative and motivating, especially for the lower ability candidates.

Centres appear to have made a fair and realistic assessment of their candidates. As would be expected if the candidates show improvement over the course, the majority of the marks awarded for this component were weighted towards the top of the mark range.

Although no written evidence or justification for the marks is required, conversations with centres have revealed that the vast majority of teachers have either designed their own record form for this or have adopted the suggested format shown on page 35 of the Centre Assessed Unit – Information for Centres & Marking Guidance 2008/2009 Issue No. 3. This booklet was given to delegates at the Teacher Standardising Meetings. New editions of this will be available at meetings this autumn and can also be requested from the Subject Office in Guildford. A copy will also be found in the administration folder of the Set 4 ISA CD.

The mark for the PSA should be entered in the appropriate space on the reverse of the Candidate Record Form. A few centres neglected to do so this year and consequently were potentially depriving their candidates of up to 6 marks. When moderators spot this they will contact the centre in order to put things right; however, this does severely delay the moderation process and could lead to delayed results.

3. Investigative Skills Assignment (ISA)

This component comprises the bulk of the marks for the CAU (34 marks). Candidates take a 45 minute test under controlled conditions based on one of the appropriate ISAs set by AQA.

Centres may get candidates to carry out as many ISAs as they wish: for each candidate however, only the one ISA that resulted in the highest mark for each subject is submitted for moderation.

The ISAs available for moderation in June 2009 were:

Set 1	B1.1 – Fieldwork	C1.1 – Unsaturation of oils	P1.1 – Thermal Insulation
	B1.2 – Reaction times	C1.2 – Viscosity of oils	P1.2 – Wind turbines
Set 2	B1.3 - Micro-organisms	C1.3 - Testing concrete	P1.3 - Efficiency of light bulbs
	B2.1 - Enzymes & temperature	C1.4 - Testing emulsions	P2.1 - Resistance
	B2.2 - Photosynthesis	C2.1 - Controlling Reactions	P2.2 - Average velocity of an object falling through air
	B3.1 - Transpiration	C2.2 - Electrolysis	P3.1 - Generators
	B3.2 - Pulse Rate & Exercise	C3.1 - Substances dissolved in water	P3.2 - Transformers
Set 3	B3.2 - Pulse Rate & Exercise	C3.2 - Burning Fuels	
	B1.4 – Caffeine	C1.5 – Investigating Plastics	P1.4 – Keeping Warm
	B2.3 – Diffusion	C2.3 – Investigating Catalysts	P2.3 – Momentum
	B3.3 – Yeast	C3.3 – Investigating Acidity	P3.3 – Electromagnets

Set 1 and Set 2 ISAs have now reached their expiry date and may therefore be used for practice purposes with candidates.

Any Set 2 ISAs that have been completed by candidates prior to July 31st 2009 may still be submitted for moderation in 2010.

Set 4 ISAs will be issued to centres at the beginning of September 2009.

For SCYC, the most popular ISAs were B1.4, C1.5 and P1.4.

For ASCC, the most popular ISAs were B2.1, C2.1 and P2.1

For the separate science, very few centres used any of the ISAs from Unit 3 - with the exception of B3.2

3.1 Support for the Centre Assessed Unit

- **Teacher Support Meetings**

Over the last 3 years, AQA's Teacher Support Department has run a number of different presentation meetings all over the country to explain the requirements of the specifications. These meetings will continue in the autumn of 2009, and will include feedback on the written papers as well as information on the CAU.

- **Teacher Standardisation Meetings**

In addition to these presentation meetings, the AQA Moderation Team ran a large number of half-day standardisation meetings for teachers. A limited number of these meetings will be available in the autumn of 2009. At these meetings, teachers are provided with standardising material and are able to ask questions about the ISAs.

Places at the Teacher Support and Standardisation Meetings may be booked through the AQA web site.

- **Centre Assessed Unit (CAU) Advisers**

Each centre has been allocated a CAU adviser. Centres are informed of the name and contact details of their adviser in September each year. Centres who do not have these details should contact the Science Department at AQA Guildford. The CAU Adviser contacts the centre at least twice a year to offer their services.

Many centres made good use of their advisers this year. Centres that had problems at the moderation stage were nearly always centres that had not made contact with their adviser.

3.2 Internal Standardisation and the Centre Declaration Sheet

It was apparent to moderators that those centres where a teacher had attended a standardisation meeting were far less likely to have their marks adjusted. However, it is a requirement that, if more than one teacher at a centre is responsible for the marking, a procedure of internal standardisation should be carried out.

The easiest way to do this is for the teacher who attended the meeting to use the exemplars and PowerPoint presentations that are provided at the standardisation meeting.

In some cases, it was apparent to moderators that such internal standardisation had not taken place.

This could result in the marks of some candidates at the centre being changed. Unlike the previous Sc1 scheme, all the ISAs are moderated as a single subject. Teachers therefore need to standardise across all the ISAs in all the different subjects. If, for example, the biology and chemistry marks are judged to be in tolerance, but the physics marks are out of tolerance, this could result in all of the candidates' marks being affected. Centres will receive one feedback form that covers all of the subjects entered.

Centres are required to complete a Centre Declaration Sheet confirming that internal standardisation has taken place, and to submit this to the moderator. Moderators reported that in several cases centres had failed to do this, and had to be reminded to submit the form. This slows down the moderation process and in extreme cases may lead to the delay in the issue of results to a centre.

3.3 Provision of ISAs

The fundamental basis of the scheme is that coursework should be part of the teaching and learning process, and not a “bolt-on” extra. Teachers are provided with an outline of each ISA as early as March of the previous academic year in the publication of Teachers’ Notes. This enables them to plan in advance when an ISA will fit into their teaching scheme.

The actual ISA tests and corresponding Mark Guidance schemes are issued to the Examinations Officer on a password-protected CD in September. Science departments are entitled to be given one printed copy of each ISA and Mark Guidance, which they should keep secure within the department. Other copies should be printed off as and when required for issue to candidates.

3.4 Choice of ISAs

ISAs for Science (SCYC) must always have the number 1 before the decimal point, e.g. B1.4, C1.3

ISAs for Additional Science must always have the number 2 before the decimal point, e.g. C2.2, P2.4

ISAs for the separate science subjects of Biology, Chemistry and Physics may have 1, 2 or 3 before the decimal point, but must be relevant to that subject, e.g. for Biology B1.3, B2.2 or B3.4

This year there was a slight increase in the number of centres that submitted inappropriate ISAs. If centres are in doubt they should consult with their CAU adviser before undertaking the ISA.

3.5 Operation of ISAs

Candidates carry out an investigation, having been provided with an outline plan by the teacher. They subsequently take the ISA test. Section 1 of the ISA asks them questions about their own investigation, the questions being based upon Section 17 of the specification, “How Science Works”. Section 2 of the ISA describes a situation in the same related area, and asks them questions about this.

There are three stages in the process of administering an ISA.

3.5.1 Stage 1

(a) The task

AQA provides teachers with a suggested approach to carrying out the investigation. However, AQA cannot provide detailed instructions, as conditions and availability of equipment will vary greatly from one centre to another. Teachers must therefore carry out their own risk assessments of any procedure used.

Teachers may adapt or amend the suggested approach. This enables teachers to tailor the investigation to fit in with their own teaching scheme. Whether or not the suggested approach has been amended, centres must complete an ISA Explanation Sheet that gives details to the moderator of how the investigation was carried out. In many cases this year this was not done. Consequently moderators had great difficulty in confirming the award of marks in Section 1 of the ISA.

One ISA Explanation Sheet is required for each different way in which an ISA has been carried out.

Teachers need to provide candidates with an *outline* method of carrying out the investigation. Where this is done by means of a printed worksheet, a copy of this should be provided to the moderator. A teacher should produce an ISA explanation sheet for each class experiment at the time that the practical is completed. It should be kept with the class ISAs and an annotated mark guidance sheet that the teacher used to mark the ISA.

It is then ready to send to the moderator should a sample be required from that class.

(b) The table of results

At the end of Stage 1, candidates must, *on their own*, produce a blank table ready for the results.

This needs to be marked by the teacher **before** the candidates proceed to carry out the practical investigation.

The table should be able to accommodate all the data that the candidate is actually going to measure and/or record during the investigation. There is no need for columns to be provided for repeats, means or any derived values. These may be included in the table if the teacher so wishes, but there are no marks awarded for their provision.

In some cases teachers had returned these tables to candidates after marking them. If the candidate subsequently alters the table (e.g. by adding units previously omitted) the teacher should annotate the table to inform the moderator of this. Failure to do so made it difficult for moderators to assess whether or not the correct mark had been awarded.

Some teachers adopted the policy of either photocopying the original blank table before returning it to the candidate, or after collecting the blank table issuing the candidate with a blank table provided by the centre. Either of these strategies is perfectly acceptable.

The mark for the table (0, 1 or 2) should be entered in the right-hand margin adjacent to the last question in Section 1 of the ISA. Failure to do so this year led to some teachers arriving at an incorrect total mark.

3.5.2 Stage 2

(a) The practical work

Candidates now carry out the practical work, working in small groups if necessary. It is important that each candidate should take part in this practical session. Any candidate who does not take an active part in this stage cannot score any marks for Section 1 of the ISA.

It is also important that each candidate should, wherever possible, obtain his or her own results. Only if this proves impossible should a teacher issue a candidate with a copy of another candidate's results.

This year moderators found a small number of instances where all the candidates at a centre had been using the same set of results. This is not generally acceptable. There may be occasions when it is necessary to pool the results of several candidates in order to be able to identify a pattern. An example of this might be a fieldwork investigation. In such cases however, it must be made clear to the moderator which of the results that particular candidate had been responsible for obtaining. This is most easily done by including the candidate's own table of results as well as that of the combined group.

(b) Drawing the graph or bar chart

At the end of Stage 2, candidates must, *on their own*, draw a suitable graph or bar chart. Some of the issues that were identified during moderation are listed below.

- Categorical variables should be displayed on a bar chart
- Continuous variables should be displayed on a line graph
- Discrete variables may be displayed on either a bar chart or a line graph
- The maximum marks to be awarded if the candidate has used the wrong type of display is 3
- Although the convention is to plot the independent variable on the x-axis, there is no penalty for reversing the axes
- Candidates should use a scale in which the data occupies at least one third of the range shown on the axis
- One plotting error is allowed out of every 5 points plotted
- If a candidate finds that there is no correlation between the independent and the dependent variable, then in order to qualify for the 4th mark in drawing a line graph, the candidate should annotate the graph to this effect, e.g. by writing "No line possible"

The mark for the graph (0, 1, 2, 3 or 4) should be entered in the right-hand margin adjacent to the last question in Section 1 of the ISA. Failure to do so this year led to some teachers arriving at an incorrect total mark.

3.5.3 Stage 3

(a) Taking the ISA test

The final stage involves candidates taking the ISA test. Some centres treated this as a normal examination and used the examination hall. Other centres felt that it was manageable to carry out the tests in the normal teaching room. Either approach is acceptable.

All of the standard procedures for special consideration that apply to written examinations are available for the ISA. These include the provision of extra time, the use of a scribe and the use of a reader.

Moderators reported that in some cases there was evidence that candidates who had difficulty in writing had not been provided with the services of a scribe. Centres are encouraged to use this provision where it is appropriate.

(b) Marking the ISA test

AQA provides teachers with a Mark Guidance scheme for each ISA. Teachers are required to use their professional judgement in marking the test, which is subsequently moderated by AQA.

One of the main difficulties encountered by moderators was the manner in which teachers marked the scripts.

Teachers are requested to mark in red ink, to put a tick in the body of the script for every mark awarded, and to enter a subtotal in the margin. This is the policy used by examiners when marking exam scripts.

However, many teachers adopted a different policy: If they felt that the candidate's answer was correct, they circled "one mark" and if they felt that it was incorrect they made no mark at all. This often left moderators wondering whether or not the teacher had actually read the answer.

(a) Annotation

The Mark Guidance suggests typical answers that a candidate may provide. However, if a candidate provides an answer that, in the judgement of the teacher, correctly answers the question, then a mark should be awarded. In such cases the teacher should provide **annotation**, either to the ISA or to the mark guidance sheet or both, to indicate the reasons for the judgement.

The level of annotation on the scripts varied greatly. It is a QCA/OFQUAL requirement that teachers should annotate the work to show where and why marks have or have not been awarded. Some centres were excellent in this respect; others put no annotation on at all, leaving moderators wondering why marks had been awarded.

A simple and quick way of providing annotation when the teacher thinks that it is a marginal decision as to whether or not the mark should be awarded is the use of the 'D' for doubt. The way in which this should be used is explained in the Guidance and Standardising Material for ISAs.

More centres this year adopted this policy and in doing so made it much easier for moderators to approve their marking standards. All centres are encouraged to use this strategy in the future.

4. Administrative matters

Some centres were very late in applying for moderation. Usually this was because they had not realised that applying for a subject award does not automatically mean that the Centre Assessed Unit will be moderated: a separate code needs to be submitted to request moderation.

Moderators have reported that although a few teachers were either slightly severe or rather lenient in their interpretation of the mark guidance, the majority were within tolerance. The moderation tolerance on this component is ± 2 out of 34 (the PSA mark out of 6 is not included in moderation). Comparatively few centres exceeded tolerance and these were mainly centres that had failed to send a teacher to a standardisation meeting.

5. Submission of work to the moderator

This year, instead of being asked to submit a rank order list, centres were asked to circle the candidate with the highest score and the candidate with the lowest non-zero score, on the Centre Mark Forms. This makes the process of candidate script selection for the sample much easier for the moderator. Many centres unfortunately failed to do this. Although it is no longer a requirement, if centres can easily provide a rank order list, this is much appreciated by the moderators.

When submitting the work to the moderator, a completed copy of the **Candidate Record Form** should be stapled to the front of each ISA. This form should be signed by both the teacher and the candidate.

Failure to obtain the candidate's signature can severely delay the moderation process. This year rather fewer centres had to be contacted in order to obtain candidate signatures. Centres are advised to get the candidate to sign the Candidate Record Form at the same time that they complete the ISA test.

The graph or bar chart and the table(s) of results for each candidate should be **stapled to the back** of the ISA test. **Please do not enclose candidates' work in plastic wallets or folders.**

The **Centre Declaration Sheet** must also be enclosed with the sample. Most centres did remember to do so this year, but a number forgot either to obtain the Head of the Centre's signature or failed to obtain the signatures of *all* of the teachers who had been involved in the marking of the ISAs.

Some centres that had entered candidates for the separate sciences as well as Science and Additional Science did not realise that if the **total** number of entries from all subjects added together exceeds 20, they should send the pink and yellow copies of the Centre Mark Forms to the moderator. This led to some centres that had entered fewer than 20 candidates for each of the five subjects sending **all** the work to the moderator, often at different times. This in turn led to a delayed start to the moderation process for those centres.

6. Common errors

Section 1 of the ISA

This section contains questions concerning the candidate's own investigation.

Most of the ISAs start with a question that asks the candidates what they were trying to find out. Candidates should be very clear about (i) what they were deliberately changing and (ii) what outcome they were going to measure or observe. Vague statements such as "I was trying to find out something about photosynthesis" will not gain any marks.

Towards the end of Section 1 on most ISAs there is a question that asks the candidates what they found out. What we are generally looking for here is a conclusion, and not simply a restatement of the results. Again, vague statements such as "I found out how viscosity changes with temperature" will not gain any marks.

Tables

Blank tables, suitable for the collection of data, must be drawn and marked before the practical work begins. In some cases centres had then returned these blank tables to the candidates for them to use during the practical work. This is acceptable providing that the teacher annotates the table to say that this is what has occurred. If no such annotation exists, the moderator cannot tell whether, for example, the candidate has put in units before or after the table has been marked.

Graphs and charts

Generally these were done well, although in a few cases centres had allowed their candidates to use ordinary lined paper instead of graph paper.

Candidates should use a sensible scale that maximises the available space whilst still providing an easy to interpret interval. Although there are occasions when it is desirable or even essential to show the origin, in many cases it is not. Candidates should therefore not be penalised for not showing the origin if it is not essential.

If the variables are continuous, then the most appropriate method of display is a line graph. In the vast majority of cases, a line of best fit (trend line) is the most appropriate line to draw. In GCSE Science AQA has always asked centres to instruct candidates to use a Line of Best Fit rather than dot-to-dot lines for all occasions in all three GCSE sciences. The new ISAs are no different.

However, the Institute of Biology expresses the view that in certain circumstances a dot-to-dot line is the most appropriate. Candidates should not be penalised if, in the professional opinion of the teacher and in

that particular case, the joining of dot-to-dot is appropriate in biological experiments. If this is the case then the work should be annotated to that effect.

Candidates should be encouraged to be more specific in their labelling of tables, graphs and charts.

For example “Time” is very vague, but “Time for the reaction to complete” or “Time for the parachute to fall” is much better. Similarly words such as ‘volume’, ‘temperature’, ‘length’ etc should be appropriately qualified.

Section 2 of the ISA

This section contains questions on data, provided by AQA, on the same topic area as the candidates' investigation.

In this section there is always one question that contains the Quality of Written Communication (*QWC*) mark. There is always a statement within the rubric that alerts the candidate to this. In several centres, teachers had failed to indicate whether they had awarded this mark or not. In addition to the marks for the science within the question, teachers should indicate that they have considered the *QWC* mark by putting a Q✓ or a Q✗ somewhere within the script. In this way moderators know that the mark has been considered.

7. Conclusions

In general, moderators were very pleased with the efforts that centres had made in both the execution of the ISAs and in their preparation of the sample material.

The marks were spread over the full range available.

8. CAU Grade Boundaries for 2009

To be found on the AQA Website at:

http://web.aqa.org.uk/over/stat_grade.php

10. Notes on Specific ISAs

The following pages show some notes on specific ISAs in Set 3 and Set 4. For notes on specific ISAs in Set 2, please see the Coursework Standardising Book Issue No. 3.

B1.4 Caffeine

Note that it is not essential to do the experiment in the laboratory. It may be better to do the experiment in another venue, e.g. a classroom, the school hall or, if you are using the computers to monitor reaction time, the computer suite - with the pupils drinking outside the class so as not to cause any problems with spilt drinks on the computers. Even the school canteen would be a good venue as the equipment being use is very simplistic if you are using the dropping of rulers again.

Q. No	Question	Comment
9(b)	How should the mean resting heart rate for Volunteer 3 be calculated?	<p>The Marking Guidelines clearly state that “This question requires an explanation ...”</p> <p>There are 3 marking points:</p> <p>(i). <i>Explain</i> that you have discounted the anomaly (ii) <i>Show</i> that you are going to add numbers together (iii) <i>Show</i> that you are going to divide by the number added together</p> <p>They may of course describe all this in words without actually doing any calculations at all.</p> <p>However, if they do show some calculations, then both $\frac{106 + 105 + 101}{3}$ and $\frac{312}{3}$</p> <p>have shown points 2 and 3 above, but have not explained point (i) – it is merely implicit</p> <p>Similarly, $\frac{106 + 132 + 105 + 101}{4}$ and $\frac{444}{4}$</p> <p>both fail to meet point (i) but gain points (ii) and (iii) on the ‘error carried forward’ principal</p> <p>Therefore all the examples above should score 2 marks.</p> <p>The allowance of 1 mark for the final correct answer of 104, without any explanation at all, is a ‘charity mark’ for the candidate who clearly knows how to do it but has failed to follow the rubric</p>

B2.3 Diffusion

Some centres have asked if it is permissible to do osmosis in potatoes for the practical work for this ISA. This is perfectly acceptable

Some centres have been asking for a method of carrying out this investigation. This is one that a teacher has done, and claims that it works well.

- Looking at diffusion using Jelly cubes we look at the different surface area by having one half of a jelly and then the other half cut into cubes (i.e. using the same mass of jelly but with different surface areas).
- These are weighed at the beginning of the experiment and then immersed in the same volume of water.
- After every 10 minutes they are reweighed and then put back into water.
- This will give us a line graph with two lines showing increase in mass (i.e. amount of diffusion) vs. time.
- From this they can show how a larger surface area can lead to higher rate of diffusion.

This one is also from a teacher

- Prepare some stained agar:
- Completely dissolve 2 g of powdered agar in 100 cm³ of boiling distilled (or deionised) water in a beaker.
- Add 10 cm³ of 0.2 mol dm⁻³ of sodium carbonate solution and 5 cm³ of phenolphthalein to the beaker and stir well.
- Smear several Petri dishes (90 mm diameter) lightly with a little vegetable oil to prevent the agar sticking.
- Pour the hot agar immediately into the Petri dishes to a depth of 10mm in each dish, and allow to cool and set. The depth can be marked on a mounted needle for easy reference when pouring to ensure consistent depth.
- When cooled, tip out onto a white tile.
- The cubes can easily be cut using a prepared grid photocopied onto acetate and the experiment worked well with 5 cm³ of 2M HCl acid where the cubes went from pink to colourless.

C1.5 Investigating Plastics

Some centres have been asking if they can carry out a standard Hooke's Law experiment, i.e. simply using one piece of plastic, adding weights one at a time and recording the amount of stretch each time.

The answer is "No"; what is required is an investigation that deals with a **comparison**. There should be at least two samples tested, and a line graph drawn for each one. Alternatively they could simply record the force needed to break two or more different types of plastic from different bags.

If you had already completed the experiment AND the ISA with your candidates prior to December 31st 2008, please write a short explanation on the ISA Explanation sheet to tell the moderator what your candidates actually did.

Q. No	Question	Comment					
7	What did you find out from your investigation?	<p>If candidates have been using different types of bag to investigate, then they are dealing with a categoric variable. Some centres have found it difficult to award 2 marks for an amplified statement in this situation.</p> <p>"I found that different types of bag needed different mass/ weight to break" = 1 mark</p> <p>"I found that Smith's bag was the strongest" would be enough for two marks, as this subsumes the statement above. They may quote some figures from their table to justify this claim, but it is not strictly necessary.</p>					
10	<p>The scientist wants to use a graph or chart to display the mean mass needed to break the plastic strip for each time of day that a carrier bag was taken for testing.</p> <p>(a) What sort of graph or chart should be used?</p>	<p>Some centres have been saying that the scientist should draw a line graph, because time is a continuous variable.</p> <p>This is not the case. The scientist did not test the same piece of plastic at different times. What he did was to sample a different bag from the production line at different times during the day. Because they are different bags, this constitutes a categoric variable, and therefore a bar chart should be drawn.</p>					
11(b)	Use the data from Graph 1 to explain in detail what happens to the length of this plastic strip as the masses are added.	<p>Unfortunately, there was a misprint in the Mark Guidance. For the second mark on the scheme, in both columns the words 'and 1.6 kg' have dropped one line down. What it should say is shown below:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 50%; padding: 5px;">The length increases a lot between 1.0 kg and 1.6 kg</td> <td style="width: 25%; padding: 5px;">Accept the plastic strip stretches a lot between 1.0 kg and 1.6 kg</td> <td rowspan="2" style="width: 25%; padding: 5px; text-align: center;">1 mark</td> </tr> <tr> <td style="padding: 5px;">Allow a range of 0.6 kg to 1.2 kg</td> <td style="padding: 5px;">Allow a range of 0.6 kg to 1.2 kg</td> </tr> </tbody> </table>	The length increases a lot between 1.0 kg and 1.6 kg	Accept the plastic strip stretches a lot between 1.0 kg and 1.6 kg	1 mark	Allow a range of 0.6 kg to 1.2 kg	Allow a range of 0.6 kg to 1.2 kg
The length increases a lot between 1.0 kg and 1.6 kg	Accept the plastic strip stretches a lot between 1.0 kg and 1.6 kg	1 mark					
Allow a range of 0.6 kg to 1.2 kg	Allow a range of 0.6 kg to 1.2 kg						

P1.4 Keeping Warm

Q. No	Question	Comment
8(b)	Suggest one other factor that should be kept constant during the test.	<p>"Thickness" should not be accepted as a control variable.</p> <p>This is because the manufacturer is trying to find the tog rating of different materials. Thickness is a property of the material, not a control variable. Thin materials will obviously have a lower tog value than thick materials, but this is what the manufacturer is trying to find out.</p>

11. Frequently Asked Questions - Issue Number 4

Q1 Carrying CAU Marks Forward

Last year one of our candidates was certificated for Biology. How can I tell AQA that I want the CAU mark from that to be **carried forward** to Additional Science this year? The ISA that they did was from B2, so it would be eligible.

A1 The procedures for submitting coursework marks are in a document that you can download from the AQA website:

http://store.aqa.org.uk/admin/crf_pdf/AQA-CAWINST-W.PDF

The important bit is this:

“If a candidate is carrying forward his/her mark enter ‘CF’ in the ‘Total Mark’ space and encode the CF box. In the space next to the candidate’s name, indicate the series, year ...”

So, when you get the Centre Mark Form, in the box for the total mark you write c/f. Then just to the left of this write where the mark has come from (in your case BLYC) together with the year (e.g. 08) and the series (e.g. 6G, meaning 6th month (June) and G for GCSE). So if you have a candidate who has a moderated mark for Biology last year and now wants to use that mark for Additional Science, you would write: from BLYC 086G

Q2 Submitting the same ISA for moderation for two different subjects

I have a candidate who is going to be certificated for both Science and Biology this year. I know that they will have to have taken two different versions of the written exam B1, but can I use the same ISA for both?

A2 Yes, this is possible providing that the ISA is one that is eligible for both subjects. Remember to fill in the candidate's name and number on both subject entry sheets.

Q3 Tables

Can I award marks for the correct units in the table, even though the quantities in the headings are wrong. I believe that this could be an "error carried forward"

We have a candidate who measured the resistance of a piece of wire using an ohmmeter. The correct table should show:

Length of wire - in cm	Resistance - in ohms
------------------------	----------------------

This candidate made up a table that showed:

Voltage - in volts	Current - in amps
--------------------	-------------------

Can they have one mark for knowing the correct units even though they did not measure either of these things?

A4 No - candidates cannot make up their own questions! This is not an occasion on which you can award an error carried forward.

Q5 Graphs

Are we allowed “squiggles” on the Y-axis of a graph if the scale would not fit on the graph paper. We were wondering, does this remove the ability to achieve the line of best-fit mark on the graph?

A5 When drawing graphs candidates should make sensible use of the graph paper. The general advice is that the data should occupy at least one third of the scale on each axis. Sometimes the origin is important, and should be included; sometimes it is not.

For example, if drawing a cooling curve when investigating the cooling of a beaker of water, there is not

much point in starting the temperature scale at anything below room temperature. Some candidates like to start the temperature axis at 0 °C for this sort of experiment, but this squashes all the data up into a thin strip at the top of the paper, and it is then very difficult to see any curve. In this example, you could start the y-axis at, say, 20 °C and this would be preferable to putting a “squiggle” in the axis.

“Squiggles” are permissible, but of course the section that contains the data must be linear. If the data spans the squiggle, then a best-fit line would not be possible. If a candidate does make this mistake, then you should not allow the mark for the y-axis scale, but you could award the mark for the line, if appropriate, as we don't want to penalise the same mistake twice.

Q6 Providing candidates with results

When attempting the Elodea ISA some of our pupils achieved very poor results due to the time of year, quality of the Elodea etc. Are we able to provide results that have been collected already so that the pupils can plot the graph/conclude etc?

A6 Wherever possible, candidates should plot their own data, however poor it may be. The quality of the data is not important. The 4 marks for graph plotting at the end of Section 1 of the ISA are simply for translating their data into an appropriate graphical format.

Only in exceptional circumstances (e.g. a candidate gets no data at all) should the teacher give them data from another candidate.

Remember however, that it is perfectly permissible for the teacher to pool all the data from the class, and the candidates then plot the pooled data.

Q7 Marking the ISAs

If a candidate answers a question on the ISA exam giving the correct answer to start with, but then carries on writing to give further information that includes an incorrect answer, are we able to give a mark for the original correct answer?

A7 The general rule is that if the question asks for one reason etc, then only one should be given. If the candidate gives more than the required number of responses, then we operate a ‘list’ principle. This means that each correct response can be regarded as +1 and each incorrect answer as –1. Therefore if a candidate was asked for one reason, and gave one correct and one incorrect response, they would score zero. If they gave two correct and one incorrect, they would score one.

Beware however of the candidate who, in giving additional information, actually gives ‘harmless irrelevance’ rather than an incorrect response. These answers are what we call ‘neutral’ and would not negate any mark that they had already achieved.

Q8 Marking question 1 in Sets 2 & 3 ISAs

We have found difficulty in applying the Mark Guidance here because of the word **change** in the independent variable. How specific do they have to be?

A8 Generally in the first question on Section 1 of the ISAs in Sets 2 & 3, we are looking for an answer of the type “I wanted to see if changing x had any effect on y”. If the candidate can correctly identify x and y, they are likely to get 2 marks.

The “change” aspect can often be implied. For example, if the candidate wrote: “I wanted to compare the amount of bacteria in water from different sources” you should award 2 marks. Here, the word “compare” is the important one.

If a candidate simply said, “I wanted to count the number of bacteria in water from different sources”, you should only allow one mark.

This is something of a fine distinction, but don't forget that you can always use the ‘D’ if you are in real doubt.

Q9 Teachers' Notes

I have lost my copies of the Teachers' Notes for the ISAs. Where can I get some more?

A9 The Teachers' Notes for sets 2, 3 and 4 are on the website. You can either navigate there by choosing any of the new science specifications and then clicking on "Assessments" in the left hand menu, or type the following directly into your browser.

www.aqa.org.uk/qual/pdf/AQA-W-4460TN-TN2-JUN07.PDF

www.aqa.org.uk/qual/pdf/AQA-W-4460TN-TN3-JUN08.PDF

www.aqa.org.uk/qual/pdf/science/AQA-W-4460TN-TN-JUN10.PDF

The Teachers' Notes for set 5 will not be issued until April next year, with the CD containing the ISAs and Marking Guidelines being sent to exams officers in September next year.

12 Examples of Useful Forms

The next few pages contain examples of forms that you may find useful.



ISA Explanation Sheet

to accompany each ISA
(You will need to fill in more than one of these sheets if different students have carried out different methods)

Centre Number					
---------------	--	--	--	--	--

Date Practical Carried Out

ISA Code

ISA Title

Name of Teacher

Independent variable

Dependent variable

Did you make any changes to the suggested method?

YES / NO

If YES give details of any changes you made to the suggested method, the equipment, chemicals etc. for this investigation.

Any other Information:

Teacher Signature:

Please attach any experimental worksheet or outline used by the candidates to carry out the investigation if available.



Centre-assessed work Candidate Record Form 2010

- GCSE *[please ✓]* Science A (4461) Biology (4411)
 Science B (4462) Chemistry (4421)
 Additional Science (4463) Physics (4451)

Centre name:

Centre no:

--	--	--	--	--

Candidate name:

Candidate no:

--	--	--	--	--

This side is to be completed by the candidate

Sources of advice and information

1. Have you received any help or information from anyone other than your subject teacher(s) in the production of this work? (Write YES or NO)
2. If you have answered YES, give details below. Continue on a separate sheet if necessary.

3. If you have used any books, information leaflets or other materials (eg videos, software packages or information from the Internet) to help you complete this work, you must list these below, unless they are clearly acknowledged in the work itself. To present material copied from books or other sources without acknowledgement will be regarded as deliberate deception.

NOTICE TO CANDIDATE

The work you submit for assessment must be your own.

If you copy from someone else or allow another candidate to copy from you, or if you cheat in any other way, you may be disqualified from at least the subject concerned.

Declaration by candidate

I have read and understood the Notice to Candidate (above). I have produced the attached work without any help apart from that which is acceptable under the scheme of assessment.

As part of AQA's commitment to assist students, AQA may make your coursework available on a strictly anonymous basis to teachers, examining staff and students in paper form or electronically, through the Internet or other means, for the purpose of indicating a typical mark or for other educational purposes. In the unlikely event that your coursework is made available for the purposes stated above, you may object to this at any time and we will remove the work on reasonable notice. If you have any concerns, please contact crf@aqa.org.uk

Candidate's signature:

Date:

This form should be completed and attached to the candidate's work and retained at the Centre or sent to the moderator as required.

PTO

This side is to be completed by the teacher

Marks must be awarded in accordance with the instructions and criteria in Section 18 of the specification.

Supporting information to show how the ISA marks have been awarded should be given in the form of annotations on the candidate's work and in the spaces below.

Code of ISA Submitted: (top of ISA form)		Mark
Comment on how the PSA marks were awarded (if required)	Investigative Skills Assignment (max 34)	
	Practical Skills Assessment (max 6)	
	Total (max 40)	

Teacher's supporting statements and concluding comments

Details of additional assistance given (if any)

Record here details of any assistance given to this candidate which is beyond that given to the class as a whole and beyond that described in the specification. Continue on a separate sheet if necessary.

Declaration by teacher

I confirm that the candidate's work was conducted under the conditions laid out by the specification.

I have authenticated the candidate's work and am satisfied that to the best of my knowledge the work produced is solely that of the candidate.

Teacher's signature:

Date:

GCSE Science – Investigative Skills Assignment – Marking Guidelines

Biology 2.2 – Photosynthesis

For use until July 2009

Last date for submission for moderation May 2010

Please mark in red ink, and use one tick for one mark. Each part of each question must show some red ink to indicate that it has been seen.

Subtotals for each part of each question should be written in the right hand margin.

Please add annotations where necessary to explain why marks have or have not been awarded.

Enter the marks for **Section 1** and **Section 2** and the **total mark** on the front cover of the answer booklet.

The teacher must sign and date the front cover of the ISA.

The papers must be kept in a secure place and must **not** be returned to candidates.

The marking guidelines show examples of typical responses that candidates may make. However, teachers should use their professional judgement in deciding whether or not to award marks. If, in the judgement of the teacher, the candidate has provided a response which correctly answers the question, then a mark should be awarded even if this response is not shown in the mark guidance. If necessary, the teacher should annotate the script and/or mark guidance to justify the decision.

In the mark guidance:

- the use of a solidus (/) indicates an alternative answer
- the use of brackets () indicates wording that is not essential in the candidate's answer, but makes the guidance more clear.

SECTION 1

	Answer	Additional Guidance	
1	Statement referring to change in the dependent variable	Dependent variable must be identified	1 mark
	eg to see if photosynthesis / the number of bubbles changes	Just 'the number of bubbles' is not sufficient	
	Independent variable correctly identified and correctly linked to dependent		1 mark
	eg ...when I change the light intensity / distance between lamp and plant variable		
2(a)	Mark dependent upon particular investigation performed		1 mark
	eg light intensity / distance between lamp and plant		
(b)(i)	By inspection of the candidate's results table / graph		1 mark

	Answer	Additional Guidance	
(ii)	Sensible value chosen Suitable reason given eg because the pattern is not clear at this value / to check the shape of the curve at this value	Note 1 mark for both value and reason Accept an extension of range if no clear reason for one within range	1 mark
3	One factor stated eg time / distance / number of bubbles / temperature	Answers should relate to variables in candidate's own investigation	1 mark
4	Any one from: eg <ul style="list-style-type: none"> to allow stabilisation rate to become constant so rate of bubbling at new value of variable is not affected by previous one 	Accept alternative ideas based on particular investigation carried out	1 mark
5	Any one from: eg <ul style="list-style-type: none"> carry out (more) repeats collect bubbles and measure volume of gas control temperature more carefully 	Accept alternative ideas based on particular investigation carried out	1 mark
6(a)	Check candidate's results table and/or graph to establish whether answer is reasonable	Look for at least a 10% variation from any trend / pattern	1 mark
(b)	Answer should relate to divergence from the pattern established by the results.	If the candidate identifies that no repeats are necessary this should be borne out by the results, if so, then the response should indicate that all the results fall on / near a smooth curve / line or expected values	1 mark
7	Amplified statement for 2 marks eg light intensity / distance between lamp and plant affects the rate of bubbling / photosynthesis for 1 mark plus the rate of photosynthesis / bubbling increases as the light intensity increases / distance decreases for 2 marks or eg there is no relationship between light intensity and the rate of the bubbling / photosynthesis for 1 mark plus the results do not show a trend / are random for 2 marks	NB statement must relate to candidate's own results Simple correct statement, stating whether or not there is a relationship between the two variables, for 1 mark only	2 marks

	Answer	Additional Guidance	
8	<p>Table: Correct headings AND units all correct for all measured variables</p> <p>Graph/chart: X axis: suitable scales chosen and labelled with quantity and units Y axis: suitable scales chosen and labelled with quantity and units Points or bars plotted correctly to within \pm 1mm Suitable line drawn on graph or bars correctly labelled on bar chart If wrong type of graph / chart, maximum 3 marks If the independent variable is: <i>continuous</i> <i>categoric</i> <i>discrete</i></p>	<p>Table with incomplete headings or units for the measured variables gains 1 mark eg all headings present = 1 mark eg all units present = 1 mark</p> <p>Accept axes reversed</p> <p>Allow one plotting error out of every 5 points plotted. Allow error carried forward from incorrect plots</p> <p>should draw a <i>best fit line graph</i> should draw a <i>bar chart</i> may draw either a <i>best fit line graph</i> or a <i>bar chart</i> (but allow dot-to-dot joining of points in this case)</p>	<p>2 marks</p> <p>1 mark</p> <p>1 mark</p> <p>1 mark</p> <p>1 mark</p>
			Max 18 marks

SECTION 2

	Answer	Additional Guidance	
9	Lettuces grow faster / ready to sell sooner at higher temperatures		1 mark
	As temperature rises effect decreases		1 mark
10	The time for the lettuces to be ready to sell		1 mark
11	Any one from: eg <ul style="list-style-type: none"> • random errors / variations more easily spotted • some (lettuces) may die 		1 mark
12(a)	Lettuces grow faster / ready to sell sooner		1 mark
(b)	Greater cost at 26°C (not compensated for by improved growth)		1 mark
13	It is a control variable / to ensure different water availability does not affect growth or results	Do not accept vague statements such as to make it a fair test unless explained	1 mark
14	Experimental control / a baseline / to compare other results with	Do not accept 'as a control variable '	1 mark
15	(The higher the concentration,) the sooner the plants are ready to sell	Accept different phrasing conveying this idea	1 mark
16	Any one from: eg <ul style="list-style-type: none"> • (genetic) variation between plants • another variable not accounted for mathematical / recording / plotting error	Do not accept statement without an explanation as to cause eg it is an anomaly	1 mark
17	Bar chart has visual effect with better impact / easier to understand		1 mark

GCSE Science – Investigative Skills Assignment – Marking Guidelines

Chemistry 1.4 – Testing Emulsions

For use until May 2009

Last date for submission for moderation May 2010

Please mark in red ink, and use one tick for one mark. Each part of each question must show some red ink to indicate that it has been seen.

Subtotals for each part of each question should be written in the right hand margin.

Please add annotations where necessary to explain why marks have or have not been awarded.

Enter the marks for **Section 1** and **Section 2** and the **total mark** on the front cover of the answer booklet.

The teacher must sign and date the front cover of the ISA.

The papers must be kept in a secure place and must **not** be returned to candidates.

The marking guidelines show examples of typical responses that candidates may make. However, teachers should use their professional judgement in deciding whether or not to award marks. If, in the judgement of the teacher, the candidate has provided a response which correctly answers the question, then a mark should be awarded even if this response is not shown in the mark guidance. If necessary, the teacher should annotate the script and/or mark guidance to justify the decision.

In the mark guidance:

- the use of a solidus (/) indicates an alternative answer
- the use of brackets () indicates wording that is not essential in the candidate's answer, but makes the guidance clearer.

SECTION 1

	Answer	Additional Guidance	
1	Statement referring to change in the dependent variable eg to see if stability of the emulsion changes	Dependent variable must be identified, Just stability alone is not sufficient	1 mark
	Independent variable correctly identified and linked to dependent variable eg when I changed the amount / volume / proportion of emulsifier used		1 mark
2(a)	Any one from: eg <ul style="list-style-type: none">• volume of oil• volume of water• the emulsifier• consistency of mixing / shaking process• time chosen to check stability		1 mark
2(b)	Affects formation of stable emulsion		1 mark
	Explanation of how it affects the formation of a stable emulsion eg changing emulsifiers may give different results / different volumes of oil will need different volumes of emulsifiers		1 mark

	Answer	Additional Guidance	
3	A categoric variable ringed	Accept correct alternative response	1 mark
4	Source of largest error correctly identified eg deciding when a stable emulsion had formed Reason correctly given eg difficult to see if there are one or two layers		1 mark 1 mark
5	One of the results would be much bigger / smaller than the other repeated results	Accept one of the results would not fit into the pattern of the others	1 mark
6	To decide on any one of the following before the investigation is carried out: <ul style="list-style-type: none"> • volume of oil • volume of water • mass / volume of emulsifier • how much mixing / shaking needed • time chosen to check stability 	Accept : <ul style="list-style-type: none"> • to see if the two ends of the range give a significant difference • to see if the range chosen gives measurable results 	1 mark
7	Amplified statement eg the stability of the emulsion increases for 1 mark plus eg as the amount / volume of emulsifier used increases for 2 marks or eg the stability of the emulsion does not depend on the amount / volume / type of emulsifier used for 1 mark plus eg as the results do not show a trend / are random for 2 marks	NB the statement must relate to the candidate's own work Simple correct statement stating for 1 mark only eg the stability of the emulsion depends on the amount / volume / type of emulsifier used for 1 mark or the stability of the emulsion does not show a trend / is random for 1 mark	2 marks

SECTION 2

	Answer	Additional Guidance	
9	Sunflower		1 mark
10	27	Award 1 mark for 26/26.6/26.7/etc. (as a result of failure to round correctly) Accept an answer in the space by the question, if one is not given in the table	2 marks
11	Sunflower Test 3 or Sesame Test 3 Volume of emulsifier needed much greater than other 2 results		1 mark
12	Any one from: <ul style="list-style-type: none"> • a homogenous / cloudy mixture • no separation of oil and water • only one layer formed 		1 mark
13	Bar chart		1 mark
14(a)	Use a burette / pipette to measure the volume of oil / water	Accept use an instrument with a smaller scale division Accept use graduated pipette	1 mark
(b)	Smaller scale divisions	Accept accurate volume delivery for graduated pipette	1 mark
15(a)	Test each oil when it is delivered	Accept add more emulsifier	1 mark
(b)	Either oil is a natural product or oil composition may vary from batch to batch	Accept oil from different sources	1 mark

	Answer	Additional Guidance	
16	Any two from: eg <ul style="list-style-type: none"> vegetable oils are unsaturated and claimed to be healthier less fatty less cholesterol company ice cream has less KJ/100g peanut oil causes allergies / gives an allergic response in some people peanut oil can be fatal for some people eating too much ice cream will still make you fat additives may cause health problems 		2 marks
	<p>Quality of written communication</p> <p>Candidates should use at least two technical terms from: eg</p> <ul style="list-style-type: none"> unsaturated healthy / healthier cholesterol obese / obesity heart attack anaphylaxis / anaphylactic shock allergy / allergic additives 	<p>The mark is to be awarded for the correct use of the terms</p> <p>The marker should circle these terms Annotate below candidate answer with <i>Q</i>✓ <i>for mark given or Q</i>×<i>for mark not given</i></p>	1 mark
17(a)	To increase sales	Accept to sell more ice cream	1 mark
(b)	Any one from: eg <ul style="list-style-type: none"> traditional implies that it is made from an old recipe dairy implies that it is made from milk or cream farm implies that it is made directly from the milk on a farm 	Do not accept 'misnamed'	1 mark
Max 16 marks			

ISA Total 34 Marks

GCSE Science – Investigative Skills Assignment – Marking Guidelines

Physics 2.1 – Resistance

For use until May 2009

Last date for submission for moderation May 2010

Please mark in red ink, and use one tick for one mark. Each part of each question must show some red ink to indicate that it has been seen.

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Please add annotations where necessary to explain why marks have or have not been awarded.

Enter the marks for **Section 1** and **Section 2** and the **total mark** on the front cover of the answer booklet.

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In the mark guidance:

- the use of a solidus (/) indicates an alternative answer
- the use of brackets () indicates wording that is not essential in the candidate's answer, but makes the guidance clearer.

SECTION 1

	Answer	Additional Guidance	
1	Statement referring to change in the dependent variable eg see if current / resistance of the wire changes Independent variable correctly identified and linked to dependent variable eg when I changed the p.d. across the wire / the length of wire / the type of wire	Dependent variable must be identified Just resistance or current alone is not sufficient	1 mark 1 mark
2(a)	Correct choice eg resistance is most likely to be the dependent variable p.d. or current will be the independent variable if one of them is the factor that was deliberately changed p.d. or current will be the dependent variable if eg the length of the wire or the type of wire was changed	This will depend upon the particular investigation	1 mark

	Answer	Additional Guidance	
2(b)	Ammeter / ohm meter / voltmeter	Must link to answer to 2(a)	1 mark
(c)	They would have been more precise		1 mark
3	Correct independent variable identified eg length of wire / type of wire / cross-sectional area of wire / p.d. / current		1 mark
4(a)	Control variable correctly identified eg length of wire / type of wire / cross-sectional area of wire / p.d. / current	This will depend on the particular investigation, but must be a factor that was kept constant by the candidate	1 mark
(b)	Idea that any variation would affect the dependent variable	Do not allow the simple statement to make it a fair test Allow to make the results valid	1 mark
5	Correct reason given Yes – because eg the wire got hot / the meter kept fluctuating or No – because eg all values matched prediction / results formed a clear pattern with no anomalous results	No mark for Yes or No. Mark is for the reason	1 mark
6	Sensible reason consistent with the candidate's results Yes – because some results did not fit the pattern / some were anomalous / to make it more reliable or No – because all results fitted a pattern / no anomalous results	No mark for Yes or No. Mark is for the reason No – not enough time can be allowed at the discretion of teacher	1 mark

SECTION 2

	Answer	Additional Guidance	
9	Units (of resistance or light intensity)	Allow ohms or Ω Allow candela or cd	1 mark
10(a)	The one tested might not be typical/ the company might have made an error	Allow - to improve the reliability	1 mark
(b)	Between 10 and 200		1 mark
(c)	The results would have been more reliable		1 mark
(d)(i)	Idea that two is too few		1 mark
	No idea what is going on between the two extremes		1 mark
(ii)	At least three (more) different values	Values stated should be approximately evenly spaced between the two extremes	1 mark
	A statement explaining this eg usually need at least 5 values to determine trend / values need to be evenly spaced		1 mark
11	Idea of increased reliability		1 mark
	Original company manufactured the LDRs, so may be biased / second company is independent		1 mark
	Quality of written communication		1 mark
	Candidates should use at least two technical terms from: eg <ul style="list-style-type: none"> • reliable • bias • independent • valid 	The mark is to be awarded for the correct use of technical terms. The marker should circle these terms Annotate below candidate answer with $Q\checkmark$ for mark given or $Q\times$ for mark not given NB Ensure that candidates are not just copying part of the question	

	Answer	Additional Guidance	
(b)(i)	(Opinion) Suitable reason given eg insufficient data / haven't tested all of them	No mark for choosing opinion. Mark is for the reason	1 mark
(ii)	Measuring instruments have had a scale marked on them		1 mark
	Between fixed, known points	Allow measuring instruments have been checked Allow against another instrument	1 mark
(iii)	Record the value of the zero error		1 mark
	Subtract this value from all readings		1 mark
			<u>Max 16 marks</u>
ISA Total 34 Marks			

Glossary of Terms

Accuracy	An accurate measurement is one which is close to the true value.
Calibration	This involves fixing known points and then marking a scale on a measuring instrument, between these fixed points.
Data	This refers to a collection of measurements. <i>For example: Data can be collected for the volume of a gas or the type of rubber.</i>
Datum	The singular of data.
Errors,	
- random	These cause readings to be different from the true value. Random errors may be detected and compensated for by taking a large number of readings. <i>For example: Random errors may be caused by human error, a faulty technique in taking the measurements, or by faulty equipment.</i>
- systematic	These cause readings to be spread about some value other than the true value; in other words, all the readings are shifted one way or the other way from the true value. <i>For example: A systematic error occurs when using a wrongly calibrated instrument.</i>
- zero	These are a type of systematic error. They are caused by measuring instruments that have a false zero. <i>For example: A zero error occurs when the needle on an ammeter fails to return to zero when no current flows, or when a top-pan balance shows a reading when there is nothing placed on the pan.</i>
Evidence	This comprises data which have been subjected to some form of validation. It is possible to give a measure of importance to data which has been validated when coming to an overall judgement.
Fair test	A fair test is one in which only the independent variable has been allowed to affect the dependent variable. <i>For example: A fair test can usually be achieved by keeping all other variables constant.</i>
Precision	The precision of a measurement is determined by the limits of the scale on the instrument being used. Precision is related to the smallest scale division on the measuring instrument that you are using. It may be the case that a set of precise measurements has very little spread about the mean value. <i>For example, using a ruler with a millimetre scale on it to measure the thickness of a book will give greater precision than using a ruler that is only marked in centimetres.</i>
Reliability	The results of an investigation may be considered reliable if the results can be repeated. If someone else can carry out your investigation and get the same results, then your results are more likely to be reliable. One way of checking reliability is to compare your results with those of others. The reliability of data can be improved by carrying out repeat measurements and calculating a mean.
True Value	This is the accurate value which would be found if the quantity could be measured without any errors at all.

Validity	Data is only valid for use in coming to a conclusion if the measurements taken are affected by a single independent variable only. Data is not valid if for example a fair test is not carried out or there is observer bias. <i>For example: In an investigation to find the effect on the rate of a reaction when the concentration of the acid is changed, it is important that concentration is the only independent variable. If, during the investigation, the temperature also increased as you increased the concentration, this would also have an effect on your results and the data would no longer be valid.</i>
Variables,	
- categoric	A categoric variable has values which are described by labels. When you present the result of an investigation like this, you should not plot the results on a line graph; you must use a bar chart or pie chart. <i>For example: If you investigate the effect of acid on different metals, eg copper, zinc and iron, the type of metal you are using is a categoric variable.</i>
- continuous	A continuous variable is one which can have any numerical value. When you present the result of an investigation like this you should use a line graph. <i>For example: If you investigate the effect on the resistance of changing the length of a wire, the length of a wire you are using is a continuous variable since it could have any length you choose.</i>
- control	A control variable is one which may, in addition to the independent variable, affect the outcome of the investigation. This means that you should keep these variables constant; otherwise it may not be a fair test. If it is impossible to keep it constant, you should at least monitor it; in this way you will be able to see if it changes and you may be able to decide whether it has affected the outcome of the experiment.
- dependent and independent variables	Often in science we are looking at 'cause' and 'effect'. You can think of the independent variable as being the 'cause' and the dependent variable as being the 'effect'. In other words, the dependent variable is the thing that changes <i>as a result</i> of you changing something else.
- dependent	The dependent variable is the variable the value of which you measure for each and every change in the independent variable.
- independent	The independent variable is the variable for which values are changed or selected by the investigator. In other word, this is the thing that <i>you deliberately change</i> to see what effect it has.
- discrete	You may sometimes come across this term. It is a type of categoric variable whose values are restricted to whole numbers. <i>For example, the number of carbon atoms in a chain.</i>
- ordered	You may sometimes come across this term. It is a type of categoric variable that can be ranked. <i>For example, the size of marble chips could be described as large, medium or small.</i>