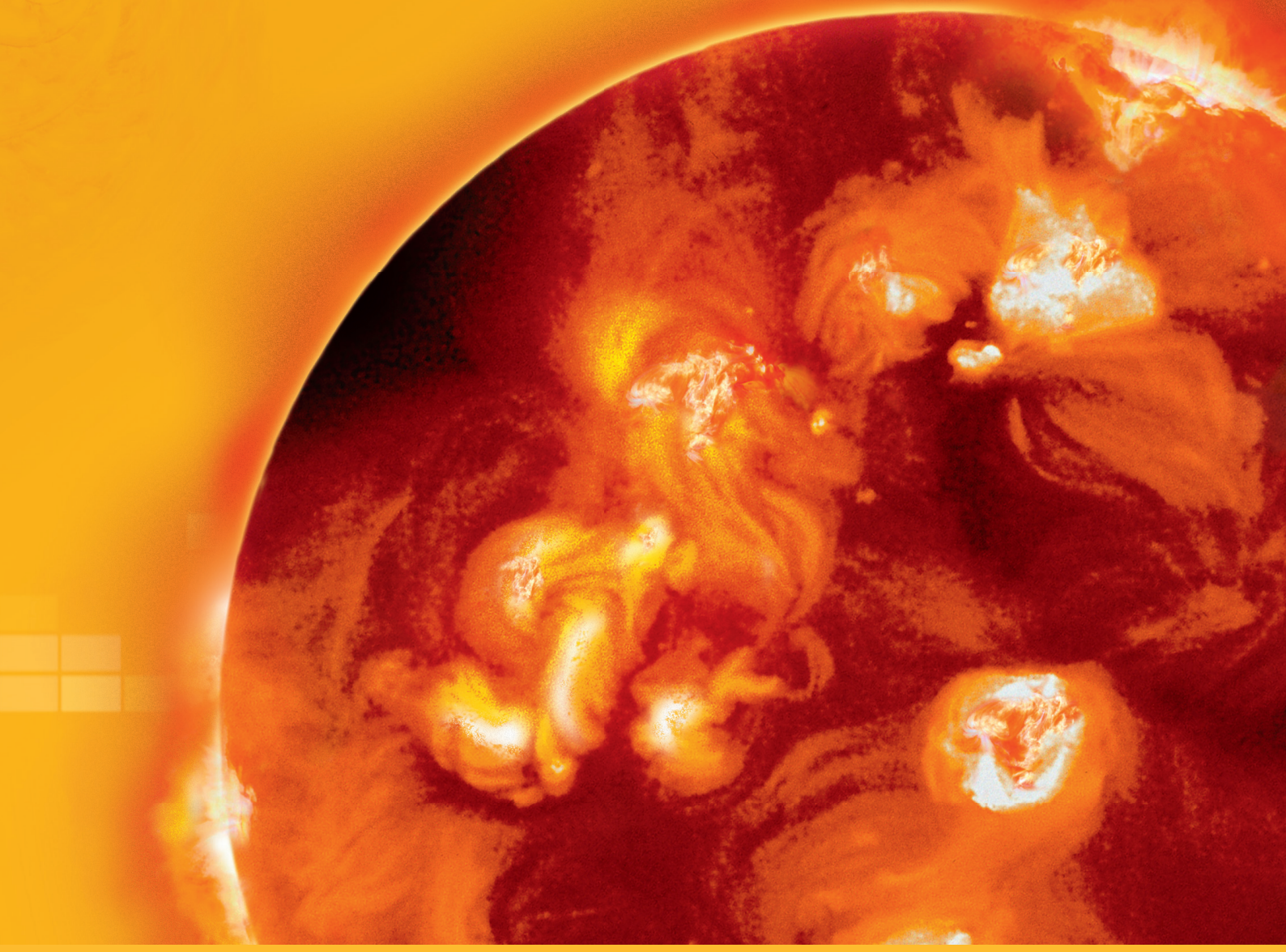
edexcel

EDEXCEL GCSE SCIENCE

Controlled Assessment guidance for teachers



ALWAYS LEARNING

PEARSON

Contents

Introduction

Our controlled assessments have been designed to give students an experience of the scientific process. However, we understand the limitations of a real school environment and so we have designed assessments to be manageable for you to implement and mark.

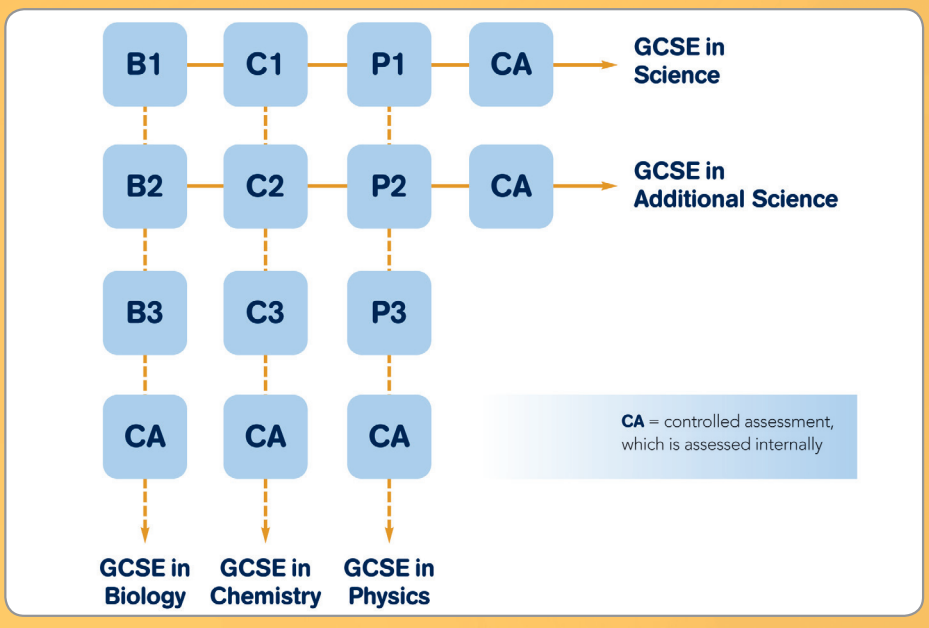
How do the controlled assessment tasks fit into the scheme of assessment?

The controlled assessment unit forms 25% of each GCSE in science. The rule of thumb is that a student needs to submit one controlled assessment task for each GCSE they sit. So a student completing GCSE Science and GCSE Additional Science will need to complete two controlled assessment tasks, one for GCSE Science and one for GCSE Additional Science.

The controlled assessments comprise three parts: A, B and C. Part A is a planning task, Part B is an observations task and Part C is a conclusions task.

For Science and Additional Science, you can submit marks from the best of the candidate's work. For example, Part A from Biology, Part B from Chemistry and Part C from Physics (or any combination of subjects). However, a candidate must complete a full controlled assessment task to submit a mark for one part. For separate sciences, parts can be taken from controlled assessments based on Units 2 or 3 or a combination of both. All work for a task needs to be submitted, rather than just the part for which the mark is being submitted. This enables moderators to evaluate all three parts of the controlled assessment tasks within the correct context.

Controlled assessments based on a practical from any Unit 2 can be used to count towards Additional Science or a separate science as long as they are from the correct subject area. For example, the controlled assessment for Unit B2 can be used by a candidate to cash-in for GCSE Additional Science or GCSE Biology. A candidate who has a mixture of marks from the controlled assessments for Units B2 and C2 can only use these marks for GCSE Additional Science and not for either separate science.



Controlled assessments are valid for one calendar year, e.g. 2013. We have two moderation windows – June and November. Tasks will be released a year in advance to centres. For example, in the case of controlled assessments which are live for 2013, the tasks will be released in January 2012.

A controlled assessment can count towards the 40% terminal requirement. GCSE Science 2011 is subject to the terminal rule which states that 40% of the qualification must be sat in the session when certification (cash-in) is claimed. All units for GCSEs in science carry a 25% weighting, meaning that at least two units must be taken at the final sitting. One of these units can be the controlled assessment unit.

Release date on website	Available for moderation in:
June 2011 (core only)	Summer 2012 – November 2012
January 2012	Summer 2013 – November 2013
January 2013	Summer 2014 – November 2014
January 2014	Summer 2015 – November 2015
January 2015	Summer 2016 – November 2016
January 2016	Summer 2017 – November 2017

What resources will we provide to help you carry out controlled assessments?

All of the following resources will be available via download on the Edexcel website.

1. The CA task itself which will always be based on practicals in the specification. This will comprise two parts: the student brief and the detailed teacher and technician notes. Students should not be given the brief in advance of the first lesson (Part A). This will be in the secure download area and will be password protected. The teacher and technician notes will provide detailed guidance on:
   - equipment and resource lists
   - a method that can be used if students fail to write an appropriate plan.
2. Generic criteria and specific marking criteria:
   - All tasks should be marked according to the generic criteria. This can be shared with students.
   - The specific marking criteria gives teachers further guidance on the answers that would be acceptable and are specific to the individual tasks. This should not be shared with students. It will be in the secure download area and will be password protected.
3. A controlled assessment workbook. This non-mandatory generic workbook is provided to help students frame their answers. A two-sided version of the workbook with questions only is available as a reference sheet, as is a student checklist. Students can access the full range of marks using the workbook and checklist.

Downloading the CA and specific marking guidance

When released the CA and the specific marking criteria will be available to download from the Edexcel website.

These documents will require the Secure Download Service profile to access.

To access these documents please contact your centre administrator/examinations officer who can facilitate the download for you. Generally the Head of Department would request these documents to be downloaded by the examinations officer who would then provide it to the Head of Department to be stored securely. Access to these documents should be limited to subject staff and not to pupils until the time it is available to all of them.

This level of security is to ensure that all candidates sit the tasks under the conditions described in the specification and to support centres in delivering the right level of control around these secure materials. This also ensures the appropriate people can access the correct materials and while making it easier for the centre: it uses the same password that exams officers use for emergency downloads of secure materials (such as question papers on the day of the exam), leading to fewer passwords.

In your centre, the people who can access the materials are:

- Head of Centre
- Examinations Assistant
- Examinations Officer
- Examinations Manager
- Registrar.

If centres experience any technical issues please contact the Edexcel helpdesk for Online Services: **0844 576 0024**.

The task

Preparing your students for controlled assessments

To help with planning and to develop skills, we have embedded a small number of practical investigations in theory units. You can use this to develop skills for controlled assessment during your normal teaching by:

- setting mock controlled assessments when you meet a practical in a topic (using the sample controlled assessments on the website)
- setting parts of a mock controlled assessment when you meet a practical in a topic, e.g. Part C based on a supplied set of results and method
- providing sample work and asking students to mark it using the generic criteria.

Since all controlled assessments follow the same format and are marked in the same way, this will familiarise your students with what they can expect in the actual assessment.

A sample controlled assessment, based on the work of real students, follows.

Task C1

Specification reference 5.24

Compare the temperature rise produced when the same volume of water is heated by different fuels.

Student brief

This controlled assessment is about how well different fuels heat water.

Some examples of fuels include methanol, ethanol, propanol and butanol.

You are going to test the hypothesis that the more carbon atoms there are in the molecule of a fuel, the better it is for heating water.

Plan an investigation to find out which fuel will raise the temperature of water the most.

You will be given the following resources:

Different fuels in spirit burners.

Part A – Planning

How to attempt the task:

You must produce a plan.

The plan must include:

- an explanation of the equipment you need to complete the task. You may want to draw a diagram of how the equipment will be set up.
- which variable (or variables) you will change and which you will keep the same.
- which measurements you would make to test the hypothesis. You should state the number and range of measurements you will take and how you will use them to test the hypothesis.
- any risks that are linked to the practical task and how you can reduce these to make your practical task safer.

You should check that the overall plan is clear and will produce a range of results that will test the hypothesis.

Part B - Observations

You are going to test the hypothesis that the more carbon atoms there are in the molecule of a fuel, the better it is for heating water.

You will test **this** hypothesis using your own method, from Part A.

You should also collect some secondary evidence on the fuels you are testing.

How to attempt the task:

- You should decide on the number and range of measurements you will make.
- Complete the practical task, recording your measurements clearly.
- Collect some secondary evidence to test the hypothesis on this task.
- Comment on the quality of the source of this secondary evidence.

Part C – Conclusions

You will need your primary and secondary evidence from Part B – Observations and information about the method you used.

How to attempt the task:

You must process and present your primary and secondary evidence from Part B using mathematical processes if relevant.

You must produce a conclusion in which you:

- review all the primary and secondary evidence, then identify and deal with any anomalies that are present.
- draw conclusions from this processed evidence to prove or disprove the hypothesis.
- show how the data supports the conclusion.
- explain how you might change the method if you were going to repeat the investigation.
- describe the primary and secondary evidence you might collect to extend your investigation and why you would collect it.

Preparing your students for Part A

Before students undertake Part A, it is recommended that you

- ensure that students are familiar with the equipment likely to be used
- ensure students have learnt the background theory needed to form/understand a hypothesis and draw conclusions.

It is acceptable for students to carry out similar experiments as long as

- the hypothesis for investigation is different to the CA (Science)
- the subject of the investigation is different to the CA
- the equipment or resources required are not identical.

Part A: Planning

For Science, candidates do not have to formulate a hypothesis; a hypothesis will be required for Additional Science, Biology, Chemistry and Physics.

Planning is expected to take about an hour and is undertaken under limited control. This means that you can discuss the theory behind the experiment with students. Students are expected to have a teacher-moderated discussion of different ways in which the practical may be undertaken and what hypothesis to test (except for Science – see above).

Students should write up their work individually, either using the workbook or on lined paper. For candidates undertaking the controlled assessment without the workbook, we advise that they are given access to the two-sided version of the workbook with questions only and a student checklist for reference.

It is acceptable

- to lead a discussion on the equipment possibilities
- to guide students if they are considering using equipment that is appropriate to use but that you do not have access to in your centre.

Part A: Planning

Hypothesis

You will be given a hypothesis in Science.

You must produce your own hypothesis in Additional Science, Biology, Chemistry and Physics.

State the hypothesis you will be testing in your investigation.

Will be testing that the more carbon atoms there are in the molecule of a fuel, the better it is for heating water.

Explain the hypothesis using scientific ideas.

If there are more carbon atoms there are more bonds to break therefore more heat is given out to allow this.

[/ 4] Additional, Biology, Chemistry, Physics

Equipment

List the equipment you will need for your investigation and give your reasons for choosing that equipment. You may draw a labelled diagram.

beaker - to hold water in
water - thing that heats up
spirit burner -
tripod - to rest beaker on
thermometer - to measure the temperature

[/ 4] Science

[/ 2] Additional, Biology, Chemistry, Physics

The student has specified some relevant equipment and has described how some of this equipment would be used. To gain a higher mark a larger range of equipment should be specified and reasons for choices should be explained in more detail. 2 marks

2

Controls

List the variables that you will control and explain how you will control each variable.

We will control the amount of water in the beaker by measuring it using a measuring cylinder. We will control the distance that the beaker will be from the spirit by not lowering or raising the clamp. We will control the temperature that we will raise the water by using a thermometer.

[/6]

The student has identified some relevant variables to control and has given a simple description of how one of these variables can be controlled. To gain higher marks the student needs to describe and explain how to control other variables. 3 marks

Risks

Identify the risks in this investigation and explain how you would manage these risks.

The beaker and the spirit burner will be hot so there will be a risk of burning. We will combat this by not touching anything that is hot and handling things with care.

[/4]

The student has identified one relevant risk and has suggested how this risk can be managed. To gain a higher mark, the student needs to identify additional relevant risks and state in their planning how they should be managed. 2 marks

3

Overall plan

Write a method to test the hypothesis.

Include the range of measurements you will make.

We need a spirit burner, weighing scales, water, a thermometer, a beaker, a clamp and a lighter. At first, we will weigh the spirit burner with the fuel, and record the measurement. We will then fill a beaker with 100 cm^3 of water, and place the beaker in a clamp with a thermometer in the water. After this we will place the spirit burner underneath the beaker, light it and wait until the temperature has increased by 20 °C. We will then blow out the spirit burner flame, replace the water in the beaker and then measure the weight of the spirit burner again. We will the repeat these steps until we have done all of the fuels.

The student's method is logically ordered and would produce meaningful results which could be used to test the hypothesis. Although the actual fuels used have not been specified they are identified in the results table. The student has planned to measure an appropriate rise in temperature for this investigation. To gain a higher mark the student could explain why the method would test the hypothesis and explain why the range of fuels and temperature rise of 20 °C was chosen. 2 marks

[/4]

Total for Planning [/ 18] Science

[/ 20] Additional, Biology, Chemistry, Physics

4

Part B: Observations

Observations are expected to take about an hour, although this will vary depending on the practical, and are undertaken under limited control. This means that students can undertake the practical work together, e.g. in pairs. However, students should decide how to note their data (e.g. table style, choice of units) and collect it individually.

Students should follow the method they produced in Part A to collect observations. However, if they do not produce a suitable method or their method is either unsafe or will not produce results, then a method can be given. An example method is provided in the teacher and technician notes.

You must not mark and annotate Part A before returning to students for Part B.

We advise that you check the exact methods candidates have planned since some may have planned to use equipment not noted in the technicians notes, as this list is based on the sample method.

Teachers may intervene on grounds of safety during collection of results. Students must observe safe practice when they are carrying out controlled assessment tasks. It is the responsibility of centres to carry out the risk assessments for all controlled assessment tasks.

One of the requirements by Ofqual for the controlled assessment task is for a candidate to collect and record secondary evidence (Part B) and then comment on the quality of the secondary evidence (Part C).

Secondary evidence can be

- data/sets of results/graphs etc.

and/or

- theories or articles which support the hypothesis and method used.

Sources of secondary evidence:

- textbooks
- scientific journals
- web research
- other candidates' results (in Part C only).

Secondary evidence is required in the following parts of the controlled assessment task.

- Part B: collection and recording of secondary evidence is likely to be a skill that will differentiate between candidates of different abilities.
- All of Part C: in Part C a teacher may give each candidate a copy of the results for the entire class and the methods used to gain the results.

Part B: Observations

Primary evidence and recording

Record your primary evidence.

Name of alcohol	Weight at start (g)	Weight at end (g)	Difference (g)	Equations
Methanol	65.291	64.060	-1.231	Done below
Ethanol	70.716	69.835	-0.881	Done below
Propanol	68.828	68.015	-0/813	$\frac{10,500}{0.813} = 12,915.13$ J/g
Butanol	66.674	65.932	-0/742	$\frac{10,500}{0.742} = 14,150.94$ J/g

[/4]

Methanol

Energy given to water = 420 × temp rise

= 420 × 25 = 10,500J

Energy given out per g of methanol burned = $\frac{\text{Energy given to water}}{\text{Mass of methanol used}}$

$\frac{10,500}{1.231} = 8529.65$ J/g

Ethanol

Energy given to water = 420 × temp rise

= 420 × 25 = 10,500J

Energy given out per g of methanol burned = $\frac{\text{Energy given to water}}{\text{Mass of methanol used}}$

$\frac{10,500}{0.881} = 11,918.27$ J/g

The student has collected and recorded appropriately a suitable range of data, i.e. mass of fuel at the start and end of the investigation. To gain a higher mark, the student needs to record repeat data.
3 marks

5

Secondary evidence

You should have collected some secondary evidence on this investigation.

State where you found your secondary evidence.

Comment on the quality of the source of this secondary evidence.

Fuel	Calculated energy input	(KJ/g)
Ethanol	9.24	9240 J/g
Propanol	10.92	10,920 J/g
Butanol	11.75	11,760 J/g

This source is from the Heinemann co-ordinated Chemistry Science higher Tier book. The information is quite reliable because they would have used more advanced equipment that would reduce heat loss. Also the computer would record the results more accurately. **[/2]**

Total for Observations [/ 6]

The student has collected and recorded some relevant secondary evidence but has not commented clearly on the quality of the source of this secondary evidence, for example the reference to 'more advanced equipment' is rather vague and unqualified.
1 mark

Part C: Conclusions

The results collected in Part B are needed for Part C. The hypothesis stated in Part A (for Science) or written by the candidates (for Additional Science and the separate sciences) and the method followed, are required in Part C for candidates to access marks.

Part C is expected to take about an hour and is undertaken under high control. This means that students work individually and you cannot discuss their work with them.

You must not mark and annotate Parts A and B before returning to students for Part C.

In addition to any secondary evidence collected in Part B, it is optional that you can provide students with the results of work undertaken by classmates. Note: to access all marks in Part C, students will need to see both Parts A and B of their classmate's work so that, for example, they can comment on whether the method led to poor results.

Part C: Conclusions

Processing evidence

State how you are going to present the results you have collected.

I'll present them as a line graph.

Present your processed results on a separate piece of paper and hand it in with your workbook.

See attached graph and table. [/ 4]

Quality of evidence

State how you identified and dealt with any anomalies from your primary and secondary evidence.

The anomalies didn't fit in the line of best fit so I ignored the anomalies on the graph. The anomalies didn't follow the pattern the others did and there were big differences between the results.

[/ 4]

The student has commented on a perceived anomaly but has not distinguished between primary and secondary evidence. In order to gain a higher mark, the student should discuss how and why further evidence should be gathered and processed. 1 mark

Conclusions based on evidence

Use scientific ideas to explain the conclusions you can draw from all your collected evidence.

My table shows that as the number of hydrocarbon atoms increase the energy given out increases. This is also shown in the graph I did. This is because the longer hydrocarbons need more energy to break the bonds and form new ones.

7

Use your conclusion to explain if the hypothesis is correct.

My conclusion shows that the hypothesis is correct. I have written my conclusion based on the evidence I gathered by doing the experiment and drawing a table and graph.

[/ 6]

The student has provided a conclusion based on evidence, which refers to the hypothesis. There is an attempt to explain the conclusion using scientific ideas but this is unclear. To gain a higher mark, they should refer to both primary and secondary evidence and use mathematical relationships (e.g. a numerical link between the number of carbon atoms per molecule of fuel and the energy needed to heat a specified volume of water) and clear scientific ideas to explain their conclusions. 3 marks

Evaluation of conclusion

State how well your evidence supports your conclusion.

My evidence supports it quite well but there are quite a lot of anomalies due to the heat lost to the air during the experiment which altered the results greatly.

Suggest what additional evidence could have been collected to provide stronger support for your conclusion.

We could have tested more types of alcohol to ensure the trend stays the same and we could have taken repeat readings to ensure accuracy.

[/ 4]

The student has suggested using other types of alcohol and taking repeat readings to provide stronger support for the conclusion. Comments about how well the evidence supports the conclusion are inconsistent with the evidence collected. 1 mark

8

Evaluation of method

Describe the strengths and weaknesses in your method.

A lot of heat was lost to the air which made our results not very reliable.

Explain how you would modify your method to improve the quality of your primary and secondary evidence.

I would make sure no heat is lost to the air to make our results as accurate as possible. I would test more types of alcohol and take repeat readings.

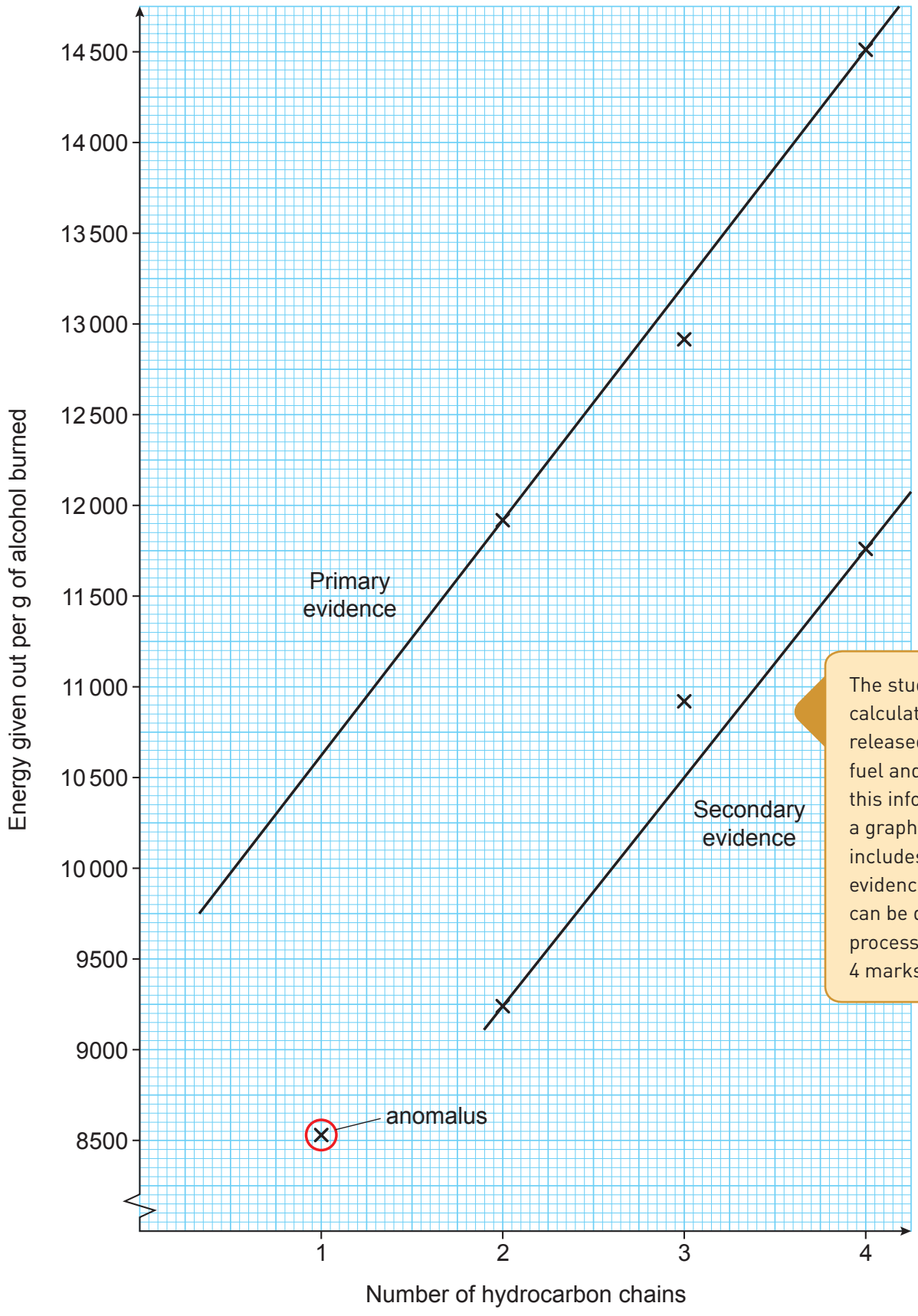
[/ 6]

Total for Conclusions [/ 24]

TOTAL FOR CONTROLLED ASSESSMENT TASK:
[/ 48] SCIENCE
[/ 50] ADDITIONAL, BIOLOGY, CHEMISTRY, PHYSICS

9

The student has identified a weakness in the method (heat loss to the air) but has not gone on to explain how the method could be modified to overcome this problem. Further discussion of strengths and weaknesses in the method would be needed to gain a higher mark. In addition, comments relating to how the method could be improved to produce better quality evidence must be justified. 1 mark



The student has calculated the energy released per gram of fuel and has presented this information on a graph, which also includes secondary evidence. Conclusions can be drawn from this processed evidence.
4 marks

How to mark the controlled assessment task

Ensure that you mark using the appropriate marking criteria – the number of marks is different for GCSE Science and the other qualifications in the suite.

It is good practice to annotate the students' work so the moderator understands your rationale for awarding a mark in each element.

Candidates will sometimes write down answers in the wrong section. Where this happens, you may award the mark and should annotate the work to show that you have done this.

Marking of Parts A and B, and annotation of work, should only be done after Part C is complete.

In Science controlled assessments, students who fail to write down the hypothesis in the workbook do not lose marks for this. However, ensure that you add the hypothesis to the work before Part C.

If student responses are relevant but fall outside the specific marking guidance, the generic criteria can be used to justify the mark. Annotate the work to show that you have done this.

If you provide a student with a method for Part B, they can still access all marks in Parts B and C. Ensure they understand that, in Part C, they should be commenting on the method they followed and not the method they originally planned.

Collecting secondary evidence in Part B is expected to differentiate between candidates of different abilities. Students do not lose marks in Part C for only evaluating the evidence of classmates if provided, and their own evidence if they did not collect secondary evidence in Part B.

Frequently asked questions

1. After downloading a CA and the related guidance, what are the security and confidentiality requirements required by Edexcel?

Answer: All materials should be stored securely as set out in the security guidance document which is available on the website.

2. Will Edexcel set a fixed timescale for the use of a CA?

Answer: Yes. Each CA will have a shelf life of one academic year in which it can be submitted for moderation. Each CA will be renewed annually. Centres that submit a CA outside of the submisson year (which will be clearly marked on each CA) will have it returned unmoderated and the candidate will not receive a result.

3. How many CAs will Edexcel produce for the GCSE Science suite of qualifications?

Answer: In the first year three CAs will be produced for GCSE Science: one for Biology, one for Chemistry and one for Physics. These CAs will be available for submission in Summer 2012 and November 2012 only. For subsequent years there will be nine CAs produced, three for each subject area (Biology, Chemistry and Physics). For Biology there will be a B1, B2 and a B3, and the same will apply for Chemistry and Physics.

4. How many CAs do students have to carry out?

Answer: The minimum is one. However a centre could choose to do more than one and submit the best mark. (See Question 12 for rules on submission of best marks.)

5. Will students have to sign an authentication sheet in addition to signing the record sheet?

Answer: No, the authentication declaration is on the record sheet so no additional sheet is necessary.

6. Will teachers/technicians receive any guidance relating to the CAs?

Answer: Yes, there are guidance notes for teachers/technicians for each CA. We have also produced specific marking guidance for teachers for each CA which should be kept secure.

7. Will the practical work involve a lot of work for technicians or require new equipment to be bought?

Answer: No, as far as possible the practical activities have been chosen to be standard activities that most centres will already do, although some adaptation of existing equipment may be needed.

8. Should the centre carry out a risk assessment before doing the practical work?

Answer: Yes, the centre is required to carry out all relevant risk assessments prior to the practical being undertaken.

9. Can students work in groups when carrying out the practical work for the CAs?

Answer: Yes, students may work in groups or independently at the direction of the teacher. Students working in groups should still record data and make observations independently.

10. What support will Edexcel put in place to help teachers manage the transition to the new CAs?

Answer: Edexcel is currently running a number of training events, please see the link below.

www.edexcel.com/quals/gcse/GCSE-science-2011/SupportPlus/Training-launch-events/Pages/default.aspx

11. Will there be a consultancy service for the GCSE Science 2011?

Answer: Yes, there will be a new consultancy service launched on 12th September 2011. Further information will be available on the website.

12. Do we submit the best CA or do we select the best mark from each of the three strands regardless of which CA they come from?

Answer: One mark is required for Part A, Part B, and Part C. The marks can either be from the same CA or from different CAs. However there are rules, which are as follows:

- Only CAs from Science B1, C1 and P1 can be used for GCSE Science
- Only CAs from Additional Science B2, C2 and P2 can be used for GCSE Additional Science
- Only CAs for Biology B2 and B3 can be used for GCSE Biology
- Only CAs for Chemistry C2 and C3 can be used for GCSE Chemistry
- Only CAs for Physics P2 and P3 can be used for GCSE Physics

13. Can the student(s) know their marks for their CAs?

Answer: Yes, but only once all Parts A, B and C have been completed by the student. Students should not be returned marked or annotated work during the completion of a CA. Students should be reminded that their marks are subject to external moderation and may be subject to change.

14.Can the student see the assessed CA?

Answer: Students can be given feedback regarding their performance on completed CAs. They may find this useful when completing future CAs. However they are not permitted to make any changes to a CA once the work has been marked by the teacher.

15. Should teachers annotate the students' work?

Answer: Yes, it is a requirement of JCQ that teachers annotate internally assessed work. The purpose of annotation is to clarify, for moderation purposes, where teachers have given credit using their professional judgement, where this is not explicit in the guidance material.

16. Can the generic or specific marking guidance be shared with the students?

Answer: The specific marking guidance should **not** be shared with students. The generic criteria may be shared with students. Teachers might consider how they can use and interpret the generic criteria so that students will understand how the assessment works.

17. Does my centre need to carry out internal standardisation?

Answer: Yes, it is a requirement of JCQ that internal standardisation takes place before the submission of work for moderation. It is important that there is a consistent assessment process carried out by all teachers involved within each centre.

Questions 18 – 21 relate to the Edexcel workbook and reference sheet

Edexcel has produced an Optional Controlled Assessment Workbook and a Controlled Assessment Reference Sheet for students. Both these document can be found at the following link:

www.edexcel.com/quals/gcse/GCSE-science-2011/Pages/Controlled-assessment.aspx

18. As these booklets are generic, is there any reason why a student cannot practise filling the booklet in before the CA is completed in controlled conditions?

Answer: Centres may use the workbook for practice with their candidates when carrying out experiments of their own or with any of the practice CAs from the teachers' pack if a centre believes this will be helpful in developing students' investigative skills. However, we would expect that many centres may not wish to use the workbook for all practicals as this might discourage a more open approach to experiments and developing skills for investigations.

19. Can students practise filling out the workbook for the CA being undertaken?

Answer: No. The CA must only be done once. The task sheets for the controlled assessment are confidential and must not be shown to students before they start the task. Task sheets should not be shown to students until the task planning stage of the controlled assessment.

20. If students are aware that they have to fill in the workbook for the CA then what is to stop them practising before the actual controlled assessment?

Answer: Students will only have access to the CA when a teacher hands this out to them in class. Therefore students would not be able to practise the actual task beforehand.

21. Could teachers mark and give the workbook back to students before the students complete the workbook under controlled conditions?

Answer: Teachers should review Part A and ensure that the proposed plan is safe. Teachers should not mark and give specific feedback to students. The feedback should be general. (See e.g. page 52 of the Science specification.)

22. Are any parts of the controlled assessment confidential and to be kept from the student until the assessment is actually undertaken?

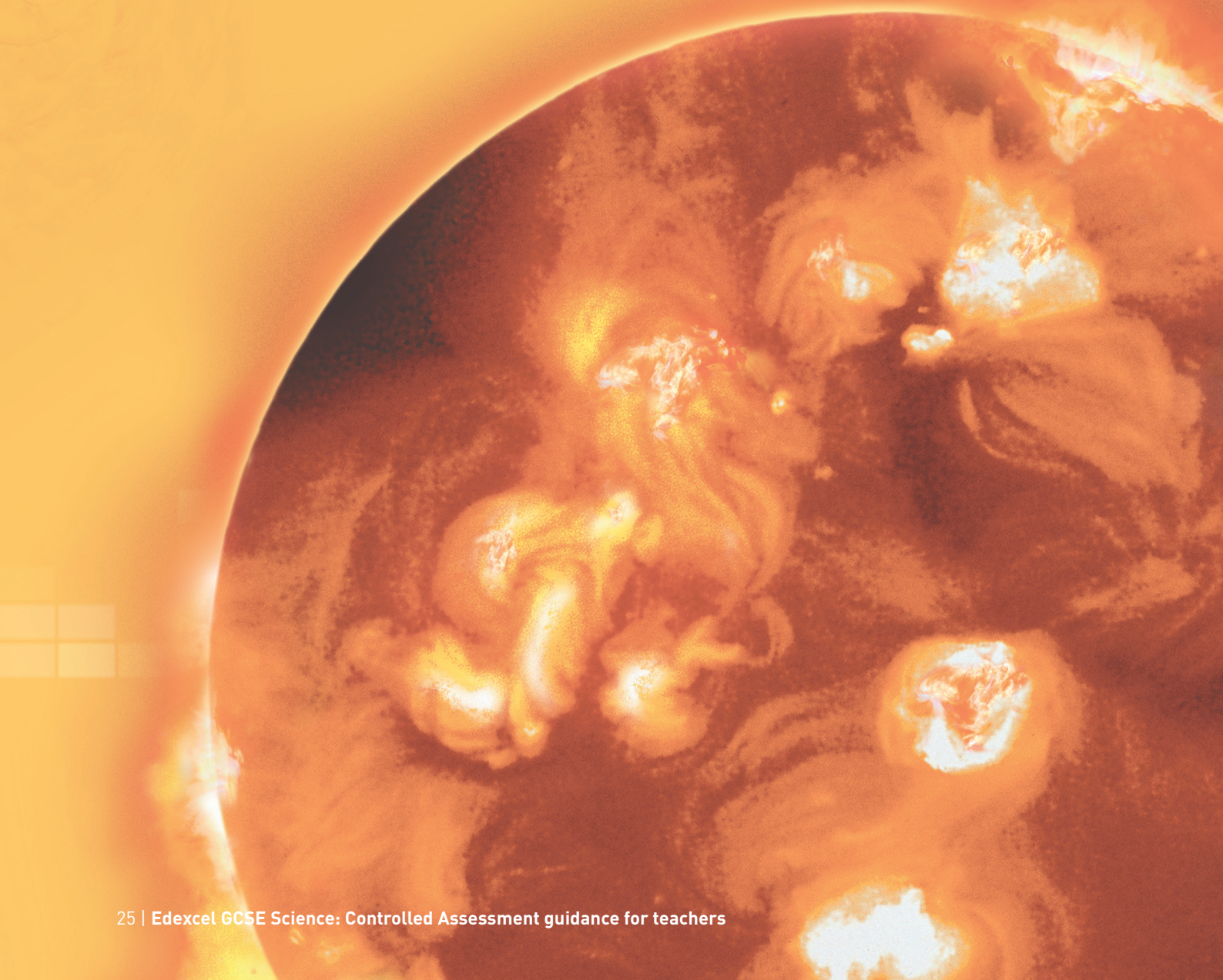
Answer: Yes all parts are confidential. The task sheets for the controlled assessment are confidential and must not be shown to students before they start the task.

23. I understand the student is to use their own method in Part B and C and that if a method is provided then the marks for Part A cannot be accepted. Can Part A marks be submitted from a different CA?

Answer: Yes, the best marks for each section may be taken from different CAs (see Question 12). However students do need to complete a full task and centres will need to retain all work. When submitting samples for moderation, complete CAs will need to be submitted with the record sheet. The record sheet must show clearly which CA each section mark is taken from.

Appendix

The appendix provides examples of generic marking criteria and specific marking guidance.



Generic marking criteria for Science

Assessment criteria

Part A - Planning

Element	Marks		Criteria
Equipment	4	0 marks	Gives no relevant detail
		1–2 marks	a) Chooses some relevant resources/equipment b) Describes reasons for choices
		3–4 marks	a) Chooses most relevant resources/equipment b) Explains reasons for choices and choices are fully relevant to method

Element	Marks		Criteria
Controls (If variables are to be controlled, criteria a1 and b1 will be used. If there are no variables to control, criteria a2 and b2 will be used. The specific criteria needed will be in the controlled assessment task.)	6	0 marks	Gives no relevant controls
		1–2 marks	a1) Identifies one appropriate variable to control b1) Describes how this variable can be controlled OR a2) Identifies one appropriate way to control the task b2) Describes this way of controlling the task
		3–4 marks	a1) Identifies some relevant variables to control b1) Gives an appropriate description of how to control these variables OR a2) Identifies some relevant ways to control the task to produce meaningful results b2) Describes how these ways control the task
		5–6 marks	a1) Identifies a range of variables appropriate to control b1) Gives an appropriate explanation of how to control these variables OR a2) Provides a comprehensive list of relevant ways to control the task to produce meaningful results b2) Explains how these ways control the task

Element	Marks		Criteria
Risks	4	0 marks	No relevant detail given
		1–2 marks	a) Identifies a relevant risk which is specific to the task b) Suggests measure(s) to manage the risk
		3–4 marks	a) Identifies most of the relevant risks which are specific to the task b) Method reflects how risks need to be managed
Overall plan	4	0 marks	Gives no relevant method
		1–2 marks	a) Method is logically ordered to produce results b) Chooses range of data/observations that would test the hypothesis
		3–4 marks	a) Method is logically ordered to produce results and includes an explanation of why it would test the hypothesis b) Chooses range of data/observations that would test the hypothesis and explains why the range was chosen
Total marks	**18**		

Part B - Observations

Element	Marks		Criteria
Primary evidence and recording	4	0 marks	Collects no primary evidence
		1 mark	Records some data/observations that are appropriate for the topic
		2 marks	Collects a suitable range of data/observations and records some appropriately (depends on the practical)
		3 marks	Collects a suitable range of data/observations and records all appropriately (depends on the practical)
		4 marks	Collects a suitable range of data/observations and records all appropriately (depends on the practical) and records further/repeat data
Secondary evidence	2	0 marks	Collects no secondary evidence
		1 mark	Collects and records secondary evidence relevant to the hypothesis in a way appropriate for the topic
		2 marks	Collects and records secondary evidence relevant to the hypothesis in a way appropriate for the topic. Comments on the quality of the sources of secondary evidence
Total marks	**6**		

Part C - Conclusions

Element	Marks		Criteria
Processing evidence	4	0 marks	Evidence is not processed
		1–2 marks	a) Attempts to process all collected evidence, using appropriate mathematical skills b) Attempts to present the processed evidence in a way appropriate for the topic
		3–4 marks	a) Processes all collected evidence in a way that is appropriate to the task, using appropriate mathematical skills b) Presents processed evidence in a way that allows conclusions to be drawn
Quality of evidence	4	0 marks	Makes no comments on the quality of the evidence
		1–2 marks	a) Comments on the quality of the primary evidence, dealing with anomalies appropriately (if no anomalies in evidence candidates need to state this) b) Comments on the quality of the secondary evidence, dealing with anomalies appropriately (if no anomalies in evidence candidates need to state this)
		3–4 marks	a) Explains any adjustments to the evidence needed, or decision not to exclude evidence b) Takes account of anomalies in primary and secondary evidence when processing evidence (using all evidence if no anomalies)

Element	Marks		Criteria
Conclusions based on evidence	6	0 marks	Makes no relevant conclusions
		1–2 marks	a) Provides a conclusion based on all collected evidence, but does not link it to the hypothesis b) Attempts to explain the conclusion using all collected evidence, including appropriate mathematical relationships
		3–4 marks	a) Provides a conclusion which refers to the hypothesis based on all collected evidence b) Explains the conclusion using the evidence, including appropriate mathematical relationships
		5–6 marks	a) Provides a conclusion which refers to the hypothesis based on all collected evidence and relevant scientific ideas b) Explains the conclusion using relevant scientific ideas and all collected evidence, including appropriate mathematical relationships
Evaluation of conclusion	4	0 marks	Makes no relevant evaluation
		1–2 marks	a) Evaluates conclusion based on all collected evidence b) Suggests how all collected evidence can be improved to provide stronger support for the conclusion
		3–4 marks	a) Evaluates conclusion based on all collected evidence and relevant scientific ideas b) Suggests how all collected evidence can be improved and extended to provide stronger support for the conclusion

Element	Marks		Criteria
Evaluation of method	6	0 marks	Makes no relevant evaluation
		1–2 marks	a) Identifies a strength or weakness in the method b) Suggests how to improve method and justifies comments made
		3–4 marks	a) Describes strengths or weaknesses in the method and reasons for any anomalies b) Suggests how to improve method and justifies comments made relating to the quality of the evidence collected (including reasons for anomalies)
		5–6 marks	a) Describes strengths and weaknesses in the method and relates them to the hypothesis, and reasons for any anomalies b) Suggests how to improve method, justifying comments made relating to the hypothesis and how better quality evidence could be produced (including reasons for anomalies)
Total marks	**24**		

Specific marking guidance for C1

Part A - Planning

Element	Marks		Criteria
Equipment	4	0 marks	No relevant detail is given.
		1-2 marks	a) Specifies some of the following: spirit burner; measuring cylinder, electronic/top-pan balance; water; boiling tube/calorimeter; clamp and stand; Bunsen burner; spill/splint; eye protection; thermometer. b) Describes why some of the equipment/materials above have been chosen. For example: thermometer to measure the temperature change; Bunsen burner to light the fuel; eye protection to prevent eye damage; boiling tube/calorimeter to hold the water while it is heated; balance for checking the mass/change in mass; clamp and stand for holding the calorimeter/boiling tube safely; spirit burner to hold the fuel safely during burning.
		3-4 marks	a) Specifies most of the following: spirit burner; measuring cylinder, electronic/top-pan balance; water; boiling tube/calorimeter; clamp and stand; Bunsen burner; spill/splint; eye protection; thermometer (give benefit of doubt for the occasional omission). b) Explains why the equipment/materials above have been chosen. For example: a suitably sensitive thermometer to distinguish between the temperature changes likely to be observed; Bunsen burner to light the fuel; eye protection to prevent eye damage; calorimeter as it is a good conductor of heat; balance for checking the mass/change in mass of spirit burner; clamp and stand for holding the calorimeter safely; spirit burner to hold the fuel safely during burning.

Element	Marks		Criteria
Controls	6	0 marks	No relevant controls are given.
		1-2 marks	a) Identifies one appropriate variable to control that the student is not investigating from the following list: time fuel is burnt for; mass of fuel; starting temperature of water; temperature rise. b) Describes how one of the above is controlled. For example: specifies a volume of water to measure out with a measuring cylinder; electronic balance used to measure mass of fuel; thermometer used to check the temperature of the water; timer used to ensure that the same time elapses on each occasion.
		3-4 marks	a) Identifies some appropriate variables to control that the student is not investigating from the following list: time fuel is burnt for; mass of fuel; starting temperature of water; temperature rise. b) Describes how the above variables are controlled. For example: specifies a volume of water to measure out with a measuring cylinder; electronic balance used to measure mass of fuel; thermometer used to check the temperature of the water; timer used to ensure that the same time elapses on each occasion.
		5-6 marks	a) Identifies all appropriate variables to control that the student is not investigating from the following list: time fuel is burnt for; mass of fuel; starting temperature of water; temperature rise. b) Explains why the above variables are controlled. For example: specifies a volume of water to measure out to allow energy transferred from fuels to be compared; electronic balance to measure mass of fuel to, say, two decimal places as quantities burnt are small; thermometer used to check the temperature of the water; timer used to ensure that the same time elapses on each occasion.

Element	Marks		Criteria
Risks	4	0 marks	No relevant details are given.
		1-2 marks	a) Identifies one risk, such as: splashes from fuels; possible rashes on skin due to contact with fuels; boiling/hot water hazard; burns. b) One of the following suggestions needed: care when handling fuels; wash splashes off skin immediately; care when working with fuels/lit fuels.
		3-4 marks	a) Identifies relevant risks, such as: splashes from fuels; possible rashes on skin due to contact with fuels; boiling/hot water hazard; burns. No marks for saying 'do not eat and drink in the lab'. b) Plan reflects how risks need to be managed, e.g. choices of equipment justified in terms of choosing safest option. Method notes clamping of calorimeter/boiling tube securely and spirit burner placed on a solid surface.

Element	Marks		Criteria
Overall plan	4	0 marks	Gives no relevant method.
		1-2 marks	a) Overall method is logically ordered to produce results, e.g. notes the need for repeat readings, and method clearly shows how the identified range will be measured and identified variables controlled. Plan covers main points, such as finding the mass of the fuel before and after burning and measuring the temperature of the water before and after heating. b) Specifies a range of suitable fuels to investigate, e.g. methanol, ethanol, propanol, butanol, or chooses suitable mass of fuel to use. Suggests time intervals to measure temperature rise, e.g. over five minutes.
		3-4 marks	a) Overall method is logically ordered to produce results, e.g. notes the need for repeat readings, and method clearly shows how the identified range will be measured and identified variables controlled. Plan covers main points, such as finding the mass of the fuel before and after burning and measuring the temperature of the water before and after heating. Plan explains how finding the mass of each fuel burnt will test the hypothesis. b) Explains that they have specified a suitable range of fuels to investigate, e.g. methanol, ethanol, propanol, butanol, or suitable mass of fuel to use. Explains why the particular range of fuels/mass of fuel has been chosen, or time interval for sampling, e.g. says that five-minute collection interval will allow enough change in temperature to see a pattern in the results/data.
Total marks	**18**		

Part B - Observations

Element	Marks		Criteria
Primary evidence and recording	4	0 marks	No primary evidence is collected.
		1 mark	Some data on the temperature change (of water) for different fuels is recorded.
		2 marks	A suitable range of fuels is tested and data is recorded in a table.
		3 marks	A suitable range of fuels is tested and data is recorded in a properly labelled table, including units in g and °C.
		4 marks	A suitable range of fuels is tested and data is recorded in a properly labelled table, including units in g and °C. Repeat readings are taken.
Secondary evidence	2	0 marks	No secondary evidence is collected.
		1 mark	Secondary evidence can be found from the Internet or textbooks and needs to be relevant to the hypothesis. This can be in the form of data, e.g. on the energy released per gram of different fuels, or relevant theory, e.g. on the combustion of fuels.
		2 marks	Secondary evidence can be found from the Internet or textbooks and needs to be relevant to the hypothesis. This can be in the form of data, e.g. on the energy released per gram of different fuels, or relevant theory, e.g. on the combustion of fuels. Students need to comment on the credibility of the source(s) of secondary evidence and why they have chosen to use it, e.g. whether it covered the same type of task carried out, or whether it has been reviewed and supports scientific theory.
Total marks	**6**		

Part C – Conclusions

Element	Marks		Criteria
Processing evidence	4	0 marks	Evidence is not processed.
		1-2 marks	a) Attempts to process all the evidence in Part B, using appropriate mathematical skills to work out which fuel was best at raising the temperature of the water. b) Attempts a bar chart or simple line graph to present evidence, such as: temperature change/mass of fuel used; number of carbon atoms and temperature change/mass of fuel (results to Part B). Errors apparent in axes/scales/plotting. Highlights parts of secondary evidence, if collected, that relate to the graph.
		3-4 marks	a) Fully processes all the evidence in Part B, using appropriate mathematical skills, e.g. on temperature changes, changes in mass and fuels used. b) Draws a correctly constructed bar chart to present evidence, such as hydrocarbon and temperature change of water/mass of fuel used. Constructs an error-free bar chart or line graph of number of carbon atoms and temperature change/mass of fuel, with line of best fit (use professional judgement for minor errors). Highlights parts of secondary evidence, if collected, which relate to the graph.

Element	Marks		Criteria
Quality of evidence	4	0 marks	No comments are made on the quality of the evidence.
		1-2 marks	a) Comments on the quality of the primary evidence, identifying any anomalies and excluding them (if no anomalies in evidence candidates need to state this). Identifies that the results obtained follow a pattern in terms of temperature rise against number of carbon atoms in fuel, or notes that for some fuels, repeat readings show that the mass used was similar. b) Comments on the quality of the secondary evidence, identifying any anomalies and excluding them (if no anomalies in evidence candidates need to state this). For example, compares trends seen in secondary evidence with those found in primary evidence, or comments on method(s) used to collect secondary evidence compared with primary evidence.
		3-4 marks	a) Explanation given for the adjustment of evidence, such as the exclusion of anomalous evidence, e.g. repeat readings indicate one measurement is out of line or sources of secondary evidence contradict and less credible sources are discounted. b) Reprocesses primary and secondary evidence after taking account of anomalies, e.g. redrawing the line of best fit on the graph.

Element	Marks		Criteria
Conclusions based on evidence	6	0 marks	No relevant conclusions are made.
		1- 2 marks	a) Makes a relevant conclusion, e.g. the more carbon atoms, the greater the temperature rise/mass of fuel used or the greater the temperature change, the greater the mass of fuel used. b) Tries to use evidence from Part B to support conclusion, e.g. ethanol produced a greater temperature rise/mass change than methanol. May attempt to use secondary evidence, e.g. data about the number of carbon atoms and temperature change. Attempts to use mathematical relationships in the conclusion, e.g. the more carbon atoms, the greater the temperature change/mass of fuel used. May refer to correlation between these variables.
		3-4 marks	a) Makes a conclusion, e.g. as the number of carbon atoms increases the temperature change increases/mass of fuel used increases, which supports the hypothesis (the more carbon atoms/bigger the fuel molecule the more bonds/products formed). b) Uses evidence from Part B to explain the conclusion, e.g. the temperature change for ethanol was 4°C greater than for methanol or propanol lost 0.3 g more mass than ethanol. May explain graph drawn. May use secondary evidence to explain the conclusion, e.g. data about the number of carbon atoms and temperature change/mass of fuel used. Uses mathematical relationships in the conclusion, e.g. when number of carbon atoms increases by one, mean temperature rise is *x* °C, or discusses correlation/proportionality between these variables.

Element	Marks		Criteria
Conclusions based on evidence (cont.)		5-6 marks	a) Uses data and evidence to draw conclusion(s) about the effect of the number of carbon atoms on the temperature rise produced/mass lost/product formed. Comments on extent to which the evidence supports the hypothesis, e.g. the more carbon atoms there are in a fuel, the better it is for heating water. b) Uses data and evidence to explain conclusion, e.g. explains graph drawn or uses ideas about the number of carbon atoms present, linked to the number of bonds formed in the product/amount of product formed. May use an equation to assist explanation. Links the amount of product formed to the temperature rise produced/mass lost during the experiment. Uses secondary evidence to explain conclusion, e.g. data about the number of carbon atoms and temperature change/mass of fuel used. Uses mathematical relationships in the conclusion, e.g. when number of carbon atoms increases by one, mean temperature rise is *x* °C, or discusses positive/negative correlation and/or proportionality between these variables.

Element	Marks		Criteria
Evaluation of conclusion	4	0 marks	No relevant evaluation is made.
		1-2 marks	a) Conclusion is evaluated based on all collected evidence, e.g. whether primary and secondary evidence lead to the same conclusion or contradict each other. b) Suggests how all collected evidence can be improved to provide stronger support for the conclusion, e.g. by testing each fuel twice or by looking for data-based secondary evidence to allow direct comparisons.
		3-4 marks	a) Conclusion is evaluated based on all collected evidence and relevant scientific ideas, e.g. whether primary and secondary evidence lead to the same conclusion or contradict each other and whether they fit with relevant scientific ideas. b) Suggests how all collected evidence can be improved and extended, e.g. by testing alcohols with longer carbon chain lengths (to match those in secondary evidence) or by finding secondary evidence to match the primary evidence for the fuels used in the investigation, to provide stronger support for the conclusion.

Element	Marks		Criteria
Evaluation of method	6	0 marks	No relevant evaluation is made.
		1- 2 marks	a) Identifies a 'good point' or 'bad point' about the method to Part B. For example: it was difficult to prevent heat loss; some of the heat energy did not go into heating the water; it was difficult to keep the starting temperature constant. b) Makes and justifies a sensible suggestion about how the method could be improved, but doesn't have to be linked to the comment made in a). For example: use shielding or insulation around the apparatus to reduce heat lost; ensure a cap is put onto the fuel to prevent evaporation.
		3-4 marks	a) Describes strengths or weaknesses in the method to Part B and reasons for any anomalies. This may be something found while doing the experiment e.g. may have found that five minutes was too long to leave the fuel burning because the water boiled for several of the experiments, meaning that the temperature rise was the same. b) Makes suggestions about how the method could be improved, ideally linked to the comments made in a). Gives reasons why these improvements are needed, for example: testing for a shorter period of time so that there is a clear temperature difference between the fuels, so they can be compared more easily; repeating the experiment will lead to better information on temperature changes, which helps to test the hypothesis.
		5-6 marks	a) Describes strengths and weaknesses in the method to Part B and relates these to the hypothesis. Comments on how the quality of the data has been influenced by these points. For example: fuels cannot be compared if temperature rise was the same; if volume of water not measured accurately, then energy transferred will vary; if same type of container for water not used, heat transferred will vary. b) Makes suggestions about how the method could be improved, linked to the comments made in a). Gives reasons why these improvements are needed and explains clearly how better quality evidence would be collected. For example: measure volume of water accurately; keep flame same distance from container; use exactly same type of container for each fuel; repeat the experiment.
Total marks	**24**		

Example

edexcel
advancing learning, changing lives

Controlled Assessment Record Sheet

Centre Name: *Community School*	Centre Number: 12345
Teacher Name: *Mr Marsh*	Unit code: 5SC04
Qualification Title: *GCSE Science*	Examination Series: *June 2012*
Candidate Name: *Christine Leggett*	Candidate Number: 0012

1. All parts completed

One mark is required for each of the areas shown in Part A, Part B and Part C. The marks can either be for Part B and Part C from the same task or from different tasks relating to Units B1/C1/P1 for this GCSE. Centres must all parts of the task for moderation.

2. The teacher has clearly shown which CAT the marks from each section are from i.e. marks for Planning from B1 and marks for Observation and Conclusions from C1

Part A – Planning			Part B – Observations			Part C – Conclusions		
Marks from	B1 A [redacted] delete as appropriate		Marks from	[redacted] C1 [redacted] delete as appropriate		Marks from	[redacted] C1 [redacted] delete as appropriate	
Element	Centre mark awarded	Max. mark	Area	Centre mark awarded	Max. mark	Area	Centre mark awarded	Max. mark
Equipment	*1*	4	Primary evidence and recording	*2*	4	Processing evidence	*2*	4
Controls	*4*	6	Secondary evidence	*0*	2	Quality of evidence	*3*	4
Risk	*3*	4				Conclusions based on evidence	*3*	6
Overall plan	*2*	4				Evaluation of conclusion	*2*	4
						Evaluation of method	*3*	6
Total	*10*	18	Total	*2*	6	Total	*13*	24
						Total for Unit SCA: Science controlled assessment	*25*	48

3. Fully completed with marks given for each element

Declaration of authentication

I declare that the work submitted for assessment is my own work and has been carried out without assistance, other than that which is acceptable under the scheme of assessment.

Candidate signature *Christine Leggett* _____

Teacher signature *F Marsh* _____

Date final record sheet signed *24 February 2012* _____

4. Declaration signed by both teacher and student, with the date

By signing the above declaration, you agree to your controlled assessment task(s) being used to support Professional Development, Online Support and Training of both Centre-Assessors and Edexcel Moderators. If you have any concerns regarding this, please contact science2011@edexcel.com.

Notes on the Record sheet for GCSE Science

1. It is important when sending samples of work to the moderator that the top part of the sheet is completed accurately and clearly. This will ensure that no unnecessary delays are incurred in the sampling of the work.
2. It is essential that the moderator can identify easily which tasks the final marks for a section are from.

In the exemplar record sheet it has been noted by the teacher that the student scored the highest mark for planning from the B1 task they completed and the highest marks for observations and conclusions were from the C1 task they completed. Hence they have put these marks on the record sheet. In this instance if the work for this student is requested for sampling then the **complete tasks** for B1 and C1 must be included.

NB It is not essential that centres carry out all three tasks (B1, C1 or P1) with their students. They may just complete one task, for example P1.

3. Marks for each part within a section must be entered and these should be added up to give a total mark for the section and the total mark overall.
4. The authentication sheet must be signed and dated.

GCSE Additional Science and Separate Science Record Sheets

The notes given apply to all record sheets for all the science qualifications.
There are similar record sheets for the other suite of Science qualifications. These can be found in the specification for the qualification or on the website as a single document.