This book is designed to complement the Badger GSCE Science AFL Core Tasks publication – ISBN 978 1 84926 417 4

After our very popular and successful KS3 Level Assessed Tasks and WebQuests for APP, we have teamed up again to produce some tasks for the new GCSE 2011.

We are both committed to Assessment for Learning and developing ICT skills of students. This book contains the traditional Grade Assessed Tasks and three Grade-Assessed WebQuests that are designed to promote teaching and learning in these areas.

To Teachers and Heads of Key Stage/Department
Please take some time to read through the teacher notes before using the tasks.

About the WebQuests
If you have not used WebQuests before, please read the detailed information in this section.

About the Grade Assessed Formative Assessment Tasks
Note that this edition is different to the previous GCSE Grade Assessed Tasks. Instead of a generic Grade Ladder we have produced Specification Specific Grade Ladders. This means that the descriptors and keywords are specific to your exam board’s requirements.

About the authors
Dr. Andrew Grevatt is an experienced science teacher and an ex-Advanced Skills Teacher. He is the author of the successful Badger science KS3 Levelled Assessment Tasks and KS3 Level Assessed Investigations. Recently he was awarded a doctorate in Science Education and is a teacher educator at the University of Sussex.

Dr. Mark Evans is an experienced Head of Science, currently Deputy Head of the City College Norwich Sixth Form Centre. He is co-author of Badger Publishing’s APP in Science series and Ideas About Science. Mark is particularly interested in the use of blended learning approaches to e-learning, practical AfL techniques and strategies for engagement and active learning.

Disclaimer
All websites referenced in this book were checked at time of publication and found suitable. However, as websites change and expire frequently, please ensure you check them yourself before use! Better to be safe than sorry.
Introducing the WebQuests
A WebQuest is an inquiry-oriented lesson format in which most or all of the information that learners work with comes from the web (see www.webquest.org).

The model was developed by Bernie Dodge at San Diego State University, who identifies a ‘real WebQuest’ as:

“being wrapped around a do-able and interesting task that is ideally a scaled down version of things that adults do as citizens or workers, requiring higher level thinking, not simply summarising. This includes synthesis, analysis, problem-solving, creativity and judgment, making good use of the web.”

Pupils are set a Grade Assessed task, and then given a series of websites to visit that develop knowledge and provide the necessary information to complete the task.

Additional paper resources are provided to assist in guiding the student through the task and producing the required report, etc.

The WebQuests are provided on www.badgerscience.com at two ability levels. An ‘Exam-Buster’ level, aimed at pupils working towards Grade C and a ‘Stretch and Challenge’ aimed at Grades C and above.

Each Level Assessed WebQuest is accompanied with teacher notes, differentiated student notes, paper support resources and pupil-friendly grade-ladders.

WebQuests are designed to develop pupil’s abilities in independent research by providing a specific research focus for each web source that they are directed to.

After completing the internet research aspect of the WebQuest, pupils then apply their findings to a Grade Assessed Task that synoptically focuses their knowledge within an open ended activity, guided by a level ladder, that is then assessed using Grade criteria.

How we use them
Our Grade-Assessed WebQuests can be accessed through the WebQuests button at www.badgerscience.com.

Experience has shown that pupils benefit from being directed through their first WebQuest.

The WebQuest process is summarised diagrammatically using pupil work overleaf
An ideal delivery sequence for WebQuest 'newbies' is:

1. Discussion of the task focusing on the student task notes and the WebQuest research sheet
2. A display of the links to the WebQuest from www.badgerscience.com (or your school's links from within your VLE)
3. Dedicated class work or homework time that requires pupils to research the first few websites within the WebQuest and collate their findings on their WebQuest research sheet
4. A follow-up session where pupil experience of their independent research and their findings are discussed and exemplary examples show-cased
5. Completion of the WebQuest research
6. Application of the research findings to the synoptic grade-assessed task, with due focus being drawn to the overview for the task on the pupil notes and the relevant outcomes on the grade ladder
7. Teacher mediated self or peer-assessment of the grade assessed task and identification of improvement targets
8. Time dedicated to improving the work according to the improvement targets, and final grading by the pupil
9. Teacher acknowledgement of the final grade.

With experienced pupils we have successfully used WebQuests both as home works and as whole-class activities within computer rooms. As each grade-assessed WebQuest has an explicit and well defined process and is designed for independent study, the internet research component has also proved to be a dependable task for science cover lessons.

**Broken Links**
WebQuests are built around the use of internet sources, and WebPages are ephemeral by nature.
If you discover a link that doesn't work, please email help@badgerscience.com and we'll replace it with an alternative.
**WEBQUESTS: PROTOCOL FOR USE**

Student notes provide guidance on the task and how to access the WebQuest on-line via [www.badgerscience.com](http://www.badgerscience.com), and use the WebQuest research sheet to independently research specific issues:

Students follow the web links within the WebQuests to specific internet sources and compile their findings on their research sheet:

Then, using the student sheet and the APP level ladder they complete, self or peer assess and improve an APP-focussed Level-Assessed Task using their research:
Filtering
Schools and LEAs vary enormously in their approach to filtering access to websites. If you intend to use a WebQuest from within a school, then it is advisable to check all links in advance from within school in order check that over-zealous filtering is not black-listing any of the links within the WebQuest.

The black-listing process is automated, and although all links are to benign, safe websites, the filtering algorithms aren’t too clever and can make mistakes.

Contacting your LEA or internet service provider should swiftly resolve any black-lists problems. However, if you have a particular request for a modified webpage to be created in order to fix a particular erroneous case of black-listing, please email details of the problem to help@badgerscience.com

VLE RESOURCES

An introduction
More and more schools have introduced Virtual Learning Environments (VLEs) or “Learning Platforms” to provide pupil access to learning resources. The DfES has required that all students have access to a VLE since September 2008, and experience shows that it is lack of resources and pedagogies that are holding up their use within UK schools.

With the right resources, a VLE can facilitate revision of key ideas, support intervention through the provision of appropriate resources and assist in formative assessment.

The support and stimulus PowerPoint presentations that accompany resources in this publication are also provided as SCORM wrapped web pages, allowing easy integration with all VLEs by you or your friendly network technician!

Grade Assessed Tasks
All of the Grade Assessed Tasks can be made available to your pupils on your school’s VLE. As each GAT is accompanied with relevant support material, pupils are able to download and work through the GATs independently. In this manner they can be delivered electronically as home works, and in addition they can be uploaded electronically on completion.

Those of you used to using Badger LATs can consider these to be LATs 2.0!

Each Grade Assessed Task is accompanied by digital stimulus materials as well as the traditional paper stimulus materials. These can be uploaded to your school’s VLE – either as PowerPoints or as WebPages using the SCORM wrapped versions. Pupils can then access the support materials online via your schools VLE.
WebQuests
Purchasers of this resource will need to request a unique password for their school by emailing password@badgerscience.com. Pupils can access the WebQuests via buttons at www.badgerscience.com or via specific links on your school’s VLE – as listed in the table below:

<table>
<thead>
<tr>
<th>Biology:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam-buster level</td>
<td><a href="http://www.badgerscience.com/photosynthesis">www.badgerscience.com/photosynthesis</a></td>
</tr>
<tr>
<td>Stretch &amp; Challenge level</td>
<td><a href="http://www.badgerscience.com/photosynthesis2">www.badgerscience.com/photosynthesis2</a></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemistry:</th>
<th></th>
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<tbody>
<tr>
<td>Exam-buster level</td>
<td><a href="http://www.badgerscience.com/bonding">www.badgerscience.com/bonding</a></td>
</tr>
<tr>
<td>Stretch &amp; Challenge level</td>
<td><a href="http://www.badgerscience.com/bonding2">www.badgerscience.com/bonding2</a></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Physics:</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Exam-buster level</td>
<td><a href="http://www.badgerscience.com/nuclear">www.badgerscience.com/nuclear</a></td>
</tr>
<tr>
<td>Stretch &amp; Challenge level</td>
<td><a href="http://www.badgerscience.com/nuclear2">www.badgerscience.com/nuclear2</a></td>
</tr>
</tbody>
</table>

The paper support resources that are associated with each WebQuest can be uploaded to your VLE, although they can be downloaded directly by pupils via links on the introductory screens on each WebQuest.

Wikis and Blogs
VLEs also offer the ability to set up Wikis or on-line Blogs for students (if that sounds like double-dutch, just think ‘on-line word processing’ and you won’t be far off!). Wikis and Blogs offer contemporary, engaging, pupil-friendly mediums through which students can produce electronic versions of their synoptic tasks, which can then be peer assessed by the class using computer suites or the interactive whiteboard.
INTRODUCING THE FORMATIVE ASSESSMENT TASKS

Each task is a simple open-ended task that assesses knowledge, understanding and skills of a significant concept from a GCSE core topic. The tasks should be photocopied with the task sheet and the grade ladder back-to-back. The grade ladder can be used by teachers and learners alike to guide their response to the task.

Each task is designed to cover the entire grade range at GCSE. We chose not to split the task into foundation and higher as many students perform better or worse depending upon the topic. This was also designed so that foundation students could see what they need to achieve to work at the higher grade. We have however, indicated if a statement is higher only with [H] as we have the keywords.

As with all new approaches, learners may need to do a few of these tasks before they get the full benefit from them. The tasks are very open and, to start with, some learners can feel overwhelmed by the freedom. They may need a lot of support and encouragement for the first few, as their confidence grows the learners gain more independence at attempting the tasks.

General approaches
These tasks are ideal to use either mid-way or towards the end of a topic. Whatever approach you decide to use, make sure that the tasks are formative. It is important that these are not used as replacement summative tests. They are designed to encourage learners to demonstrate what they understand and to have the opportunity to improve. This is the foundation of formative assessment strategies: Where am I now? What am I aiming for? How do I get there?

The tasks are designed to give learners the opportunity to show their full potential in science. To ensure this, I allow the class to use their notes from exercise books, text books and other secondary sources to help them with the task. I also encourage the learners to talk with their peers about the task and discuss their ideas. This rarely leads them to copy each other, but does encourage the development of their ideas and challenges their misconceptions. Some teachers have tried the test-conditions approach to the tasks, but find that it stifles the opportunities for learning.

Standard approach
Starter activity (5-10 minutes) to introduce the task. There is a PowerPoint for each Task. Make sure each learner knows which grade they should be aiming for.

Main activity (30-40 minutes) – learners attempt task. Teacher circulates, encouraging use of the grade ladder and challenging misconceptions.

Plenary activity (10 minutes) – self or peer-assessment, where grade ladders are used to decide on grade and improvement targets.

Homework activity – make the improvement, teacher collects and assesses them, giving one improvement target.
The grade ladder has been produced from the Grade Descriptors that are in all the Specifications. We have used this as a starting point for all our Grade Ladders.

<table>
<thead>
<tr>
<th>To get grade</th>
<th>You should have:</th>
</tr>
</thead>
</table>
| A            | • Recall *precise* knowledge and detailed understanding.  
• Select *precise* knowledge and detailed understanding.  
• Communicate *precise* knowledge and detailed understanding.  
• Demonstrate a *comprehensive* understanding of the nature of science.  
• Demonstrate a *comprehensive* understanding of laws.  
• Demonstrate a *comprehensive* understanding of principles and applications.  
• Demonstrate a *comprehensive* understanding the relationship between science and society.  
• Understand the relationships between scientific advances, their ethical implications and the benefits and risks associated with them.  
• Use scientific and technical knowledge, terminology and conventions *appropriately* and *consistently*.  
• Show a *detailed* understanding of scale in terms of time, size and space.  
• Apply appropriate skills, including mathematical, technical and observational skills, knowledge and understanding effectively in a *wide* range of practical and other contexts.  
• Show a comprehensive understanding of the relationships between hypotheses, evidence, theories and explanations.  
• *Make effective use* of models, including mathematical models, to *explain* abstract ideas, phenomena, events and processes.  
• Use a *wide* range of appropriate methods, sources of information and data consistently, applying *relevant* skills to address scientific questions, solve problems and test hypotheses.  
• Analyse, interpret and *critically* evaluate a *broad* range of quantitative and qualitative data and information.  
• Evaluate information systematically to develop arguments and explanations taking account of the limitations of the available evidence.  
• Make reasoned judgments consistently and draw detailed, evidence-based conclusions. |
| C            | • Recall *secure* knowledge and detailed understanding.  
• Select *secure* knowledge and detailed understanding.  
• Communicate *secure* knowledge and detailed understanding.  
• Demonstrate understanding of the nature of science.  
• Demonstrate understanding of laws.  
• Demonstrate understanding of principles and applications. |
| C | • Demonstrate understanding the relationship between science and society.  
  • Understand that scientific advances may have ethical implications, benefits and risks.  
  • Use scientific and technical knowledge, terminology and conventions appropriately.  
  • Show understanding of scale in terms of time, size and space.  
  • Apply appropriate skills, including mathematical, technical and observational skills, knowledge and understanding effectively in a range of practical and other contexts.  
  • Show an understanding of the relationships between hypotheses, evidence, theories and explanations.  
  • Use models, including mathematical models, to describe abstract ideas, phenomena, events and processes.  
  • Use a range of appropriate methods, sources of information and data consistently, applying skills to address scientific questions, solve problems and test hypotheses.  
  • Analyse, interpret and evaluate a range of quantitative and qualitative data and information.  
  • Understand the limitations of evidence and use evidence and information to develop arguments with supporting explanations.  
  • Draw conclusions based on the available evidence. |
|---|---|
| E | • Recall limited knowledge and detailed understanding.  
  • Select limited knowledge and detailed understanding.  
  • Communicate limited knowledge and detailed understanding.  
  • Recognise simple inter-relationships between physics and society.  
  • Show a basic understanding that scientific advances may have ethical implications, benefits and risks.  
  • Use limited scientific and technical knowledge, terminology and conventions appropriately.  
  • Show some understanding of scale in terms of time, size and space.  
  • Apply skills, including limited mathematical, technical and observational skills, knowledge and understanding effectively in a range of practical and other contexts.  
  • Recognise and use hypotheses, evidence, theories and explanations.  
  • Explain straightforward models of phenomena, events and processes.  
  • Use a range of appropriate methods, sources of information and data consistently, applying skills to address scientific questions, solve problems and test hypotheses.  
  • Use a limited range of skills and techniques, they answer scientific questions, solve straightforward problems and test ideas.  
  • Interpret and evaluate limited of quantitative and qualitative data and a narrow range of sources.  
  • Draw elementary conclusions having collected limited evidence. |
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Note that Webquest C1WQ and Formative Assessment Tasks C1-C4 are in the *Badger Core Science GCSE, Formative Assessment Tasks & Webquest* publication. Tasks for Triple Topics are in *Badger Chemistry GCSE supplementary task publications*.

Creating Compounds: Ionic & Covalent Bonding

Grade Assessed WebQuest
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Note that Webquest P1WQ and Formative Assessment Tasks P1-P4 are in the *Badger Core Science GCSE, Formative Assessment Tasks & Webquest* publication. Tasks for *Triple* Topics are in *Badger Physics GCSE supplementary task* publication.

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**LINKS TO EXAM BOARD SPECIFICATIONS**

We have attempted to write activities that match all the exam board specifications. This is not always possible, but there are at least 12 of the 15 tasks in each book that will be suitable for the exam board that you use.

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<th>Task Title</th>
<th>AQA A</th>
<th>EDEXCEL</th>
<th>OCR B Gateway</th>
<th>OCR A 21st Century</th>
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<td>B2.13</td>
<td>B4b</td>
<td>B4.2</td>
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<td>B1.1</td>
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<td>B5.1</td>
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<td><strong>B6 DNA – Watson &amp; Crick</strong></td>
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<td>B3a</td>
<td>B5.3</td>
</tr>
<tr>
<td><strong>B7 Respiration</strong></td>
<td>B2.6</td>
<td>B2.1</td>
<td>B3c</td>
<td>B4.3</td>
</tr>
<tr>
<td><strong>B8 Ecology</strong></td>
<td>B4.2</td>
<td>B2.22</td>
<td>B4a</td>
<td>-</td>
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<tr>
<td><strong>C2WQ Creating Compounds: Ionic &amp; Covalent Bonding</strong></td>
<td>C2.1</td>
<td>C2</td>
<td>C4bc</td>
<td>C4.1</td>
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<tr>
<td><strong>C5 Element Groups</strong></td>
<td>C2.1</td>
<td>C4.1</td>
<td>C4d</td>
<td>C4.1</td>
</tr>
<tr>
<td><strong>C6 Mendeleev</strong></td>
<td>-</td>
<td>C1.1</td>
<td>C4c</td>
<td>C4.1.4</td>
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<td>-</td>
<td>C3h</td>
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<tr>
<td><strong>C8 Rates of Reaction</strong></td>
<td>C2.4</td>
<td>5C.7</td>
<td>C3a</td>
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<td><strong>P2WQ Nuclear Fission: Energy from the Atom</strong></td>
<td>P2.5</td>
<td>P5</td>
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<td><strong>P5 Motion</strong></td>
<td>P2.1</td>
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<td><strong>P7 Appliance Power</strong></td>
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<td><strong>P8 Static electricity</strong></td>
<td>P1.7</td>
<td>P1.8</td>
<td>P4a</td>
<td>-</td>
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</tbody>
</table>
**Aims**

- Know the structure of a plant cell and the functions of the organelles
- Describe the findings of Van Helmont and Joseph Priestly
- Explain how the process of photosynthesis takes place
- Understand the different ways in which the plant uses the glucose that is manufactured
- Compare the influence of the limiting factors of temperature, light levels and carbon dioxide concentrations

**Key words:** cell, organelle, cellulose cell wall, membrane, cytoplasm, nucleus, chloroplast, mitochondria, vacuole, leaf, photosynthesis, carbon dioxide, oxygen, glucose, starch, limiting factor

**Introduction**

Following the taxonomy of WebQuests, this activity is predominately a judgment and design task.

The WebQuest asks the students to suggest how we could maximise the production of food on a future space flight or on a moon base or settlement on a distant planet. As they progress through the WebQuest they move from revising the structure and function of the plant cell and its organelles to consider the adaptations that make the leaf efficient at photosynthesis. The process of photosynthesis is explored in detail, and the limiting factors of light levels, carbon dioxide and temperature are investigated. One of the WebQuest links examines the historic work of Van Helmont and Joseph Priestly—(an exam requirement from OCR Gateway.)

**Process**

Pupils should access the WebQuest through the ‘Do a WebQuest’ button on [www.badgerscience.com](http://www.badgerscience.com) or through the short-cut link described in the introduction to this book.

Selecting the Additional Science link from the ‘Do a WebQuest’ button offers access to two versions, a foundation tier ‘Exam-Buster’ version and a higher tier ‘Stretch and Challenge’ version. Clicking on the respective link will take the students to a series of WebPages that contain source material, and will guide them to individual websites and video clips which will focus their research.

They compile their individual research on a WebQuest research sheet, and there are two versions, one for each level of WebQuest. Students can download and print out the appropriate WebQuest research sheet from the ‘Process’ page of each WebQuest if required.
**Differentiation**

The Exam-Buster version focuses on the Additional knowledge needed up to and including grade C.

The Stretch and Challenge version considers more thoroughly the chemical nature of photosynthesis, stresses the need to comprehend the equation for photosynthesis and also requires detailed explanation of the factors which influence the process.

**WEBQUEST STAGES**

The ‘Introduction’ and ‘Process’ WebPages describe the purpose of the WebQuest, and provide access to a download of the WebQuest Research sheet.

The ‘Conclusion’ screen asks the students to apply their research in the form of a recommendation on how we could maximise the growth of crops in the future during a long space flight or on a settlement on a moon or distant planet.

**THE GRADE – ASSESSED TASK**

After completing the WebQuest, students will have lots of research on the detail of photosynthesis, together with an understanding of the factors that limit it.

The grade assessed task asks the student to pull together their findings and to suggest ways in which future space flight to human bases on distant moons or planets could maximise the growth of crop plants.

Scientific ideas and knowledge that they could include are:

- The parts of a plant cell and their functions
- Early ideas about photosynthesis and the work of Van Helmont and Joseph Priestly
- How leaves are adapted for doing photosynthesis
- The detailed process of photosynthesis
- The uses that a plant makes of the glucose that it creates
- The factors which influence the rate at which photosynthesis takes place

The Grow More: Maximising Photosynthesis WebQuest Grade Ladder could be used to help complete the task as well as formatively to assess it.
**GA WebQuest: Student Task Sheet**

**Grow More: Maximising Photosynthesis**

**Aims**
- Know the structure of a plant cell and the functions of the organelles
- Describe the findings of Van Helmont and Joseph Priestly
- Explain how the process of photosynthesis takes place
- Understand the different ways in which the plant uses the glucose that is manufactured
- Compare the influence of the limiting factors temperature, light levels and carbon dioxide concentrations on photosynthesis

**Key words:** cell, organelle, cellulose cell wall, membrane, cytoplasm, nucleus, chloroplast, mitochondria, vacuole, leaf, photosynthesis, carbon dioxide, oxygen, glucose, starch, limiting factor

**How to complete the Grade Assessed Task**

Click on the ‘Do a WebQuest’ button and choose the link to ‘Additional Science’ WebQuests. You can then choose to do the Photosynthesis WebQuest, either the ‘Exam-Buster’ version or the trickier ‘Stretch & Challenge’ version.

As you work through the WebQuest, enter your findings onto your WebQuest research sheet. The information that you need to find on each website is described on the WebQuest screen, and is also listed on your WebQuest research sheet.

Remember that you are trying to understand how plants make their own food through the process of photosynthesis, and how this process can be maximised.

**Your Grade – Assessed Task:**

After completing your WebQuest you will have lots of research on the process of photosynthesis, how a plant does it and the factors that determine how quickly it takes place.

The final grade assessed task asks you to apply your knowledge to suggest how humans can maximise the growth of crop plants in the future on long space flights or on bases on moons or distant planets.
Some things that you could include in your work are:

- The parts of a plant cell and their functions
- Early ideas about photosynthesis and the work of Van Helmont and Joseph Priestly
- How leaves are adapted for doing photosynthesis
- The detailed process of photosynthesis
- The uses that a plant makes of the glucose that it creates
- The factors which influence the rate at which photosynthesis takes place and how this could be maximised to grow food efficiently as possible in space

*Use your Grow More: Maximising Photosynthesis WebQuest Grade Ladder to help you complete the task.*