Applied Science Additional Supplement Topics

AQA and OCR Gateway Specifications

Dr Andrew Grevatt & Dr Mark Evans

www.badgerscience.com

To use parts of the website, a password is needed. This can be requested on the website by purchasers of this resource.

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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 2011 GCSE.

We are all committed to assessment for Learning and developing ICT skills of all students. This book contains the traditional Grade Assessed WebQuest and four Formative Assessment Tasks 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 Learning’s APP in Science series, Ideas About Science and the new series of GCSE Formative Tasks. Mark is particularly interested in evidence-based education, and the effective application of evidenced-based strategies within schools and colleges.

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.

A WebQuest is provided on www.badgersscience.com/applied at two ability levels. An ‘Exam-Buster’ level, aimed at pupils working towards grade C, and a ‘Stretch & Challenge’ aimed at grades C and above.

The Grade Assessed WebQuest is accompanied by teacher notes, differentiated student task sheet, paper support resources and pupil-friendly grade ladders.

WebQuests are designed to develop pupils’ 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 grade 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.badgersscience.com/applied.

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

The WebQuest process is summarised diagrammatically using pupils’ work overleaf.
An ideal delivery sequence for WebQuest ‘newbies’ is:

1. Discussion of the task focussing on the Student Task Sheet and the Exam-Buster and Stretch & Challenge sheets.

2. A display of the links to the WebQuest from www.badgerscience.com/applied (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 pupils’ 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 homework 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 they are also suitable for science cover lessons.

**Broken Links**

WebQuests are built around the use of internet sources, and websites 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

The Student Task Sheet provides guidance on the task and how to access the WebQuest on-line via www.badgerscience.com/applied. Students use the Exam-Buster or Stretch & Challenge sheets to independently research specific issues:

Students follow the weblinks within the WebQuests to specific internet sources and compile their findings on their level appropriate sheet:

Then, using the student sheet and Grade Ladder they complete, self or peer-assess and improve a grade-assessed task using their research:

These example pages are taken from GCSE Formative Assessment Tasks - Core Science.
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 can make mistakes.

Contacting your LEA or internet service provider should swiftly resolve any black-list 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 all students to 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
The Grade Assessed Tasks (GATs) can be made available to your pupils on your school's VLE. As the GAT is accompanied by relevant support material, pupils are able to download and work through the GAT independently. In this manner, they can be delivered electronically as homework, and in addition they can be uploaded electronically on completion.

Those of you used to using Badger Levelled Assessment Tasks (LATs) can consider these to be LATs 2.0!

The GAT 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 school's 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>Chemistry</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Exam-buster level</td>
<td><a href="http://www.badgerscience.com/cardiovascular">www.badgerscience.com/cardiovascular</a></td>
</tr>
<tr>
<td>Stretch &amp; Challenge level</td>
<td><a href="http://www.badgerscience.com/cardiovascular2">www.badgerscience.com/cardiovascular2</a></td>
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</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 which assesses knowledge, understanding and skills of a significant concept from a GCSE core topic. The tasks should be photocopied with the Student 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 keyword is higher with the symbol (H).

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. Whichever 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. From our experience we have found that by allowing the class to use their notes from exercise books, text books and other secondary sources it helps them with the task. We also encourage 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) – 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.
## GENERIC GRADE LADDER

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 be able to:</th>
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</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 of 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 understanding.  
• Select *secure* knowledge and understanding.  
• Communicate *secure* knowledge and detailed understanding.  
• Demonstrate an understanding of the nature of science.  
• Demonstrate an understanding of laws.  
• Demonstrate an understanding of principles and applications. |
<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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| C     | Demonstrate an 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 understanding.  
|       | Select limited knowledge and understanding.  
|       | Communicate limited knowledge and detailed understanding.  
|       | Recognise simple inter-relationships between science 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, to answer scientific questions, solve straightforward problems and test ideas.  
|       | Interpret and evaluate a limited range of quantitative and qualitative data and a narrow range of sources.  
|       | Draw elementary conclusions having collected limited evidence. |
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- P13 Teacher Notes
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P14 Physical Properties Formative Assessment Task
- P14 Teacher Notes
- P14 Student Task Sheet (for both Exam Boards)
- P14 Support Sheet
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- P14 Grade Ladder OCR Gateway
**LINKS TO EXAM BOARD SPECIFICATIONS**

We have attempted to write activities that match all the exam board specifications.

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<tr>
<td>C14 Chemical Farming</td>
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<tr>
<td>P13 Mobile Joints</td>
<td>3.3.3.3</td>
<td>A1.3</td>
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<tr>
<td>P14 Physical Properties</td>
<td>3.3.4.1</td>
<td>B1.2</td>
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GA WebQuest: The Cardiovascular System
Teacher Notes

Aims
- Understand the components of blood and the jobs that each component performs.
- Know the structure of the heart.
- Describe the parts that make up the cardiovascular system.
- Illustrate how blood travels through the heart and the rest of the circulatory system.
- Explain the role of blood in ensuring the production of energy through respiration.

Keywords: heart, ventricle, atrium, blood vessel, artery, capillary, vein, valve, blood, cardiovascular system, circulatory system, aerobic respiration, anaerobic respiration

Introduction
Following the taxonomy of WebQuests, this activity is predominately a re-telling and creative product task.

The WebQuest asks the students to discover the components which make up the cardiovascular system. The function of blood components and blood vessels are summarised. The structure of the heart and the passage of blood through it and around the cardiovascular system are explored. The link between the reactants and products of respiration and the circulatory system is emphasized.

Process
Pupils should access the WebQuest through the ‘Do a WebQuest’ button on www.badger-science.com/applied or through the short-cut link described in the introduction to this book.

Selecting the Applied Science link from the ‘Do a WebQuest’ button offers access to two versions of the Biology WebQuest, a foundation tier ‘Exam-Buster’ version and a higher tier ‘Stretch & Challenge’ version. Clicking on the respective link will take the students to a series of WebPages which 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 the 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 core knowledge needed up to and including grade C.

The Stretch & Challenge version considers more advanced biology, including the word and symbol equations for respiration.

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 findings in the creation of a PowerPoint presentation or instruction leaflet.

THE GRADE ASSESSED TASK
After completing the WebQuest, students will have lots of research on the detail of the circulatory system and the components that comprise it.

The Grade Assessed Task asks the student to pull together all of their findings in order to produce a guide for trainee fitness mentors, informing them of the importance and detail of the cardiovascular system.

Scientific ideas and knowledge that they could include are:

- What blood contains, and the jobs performed by the different components,
- What the heart is like, including its structure,
- The different components that make up the cardiovascular system, including the various types of blood vessel,
- How blood is pumped by the heart around the body and how it flows through the heart,
- How the cardiovascular system makes sure that the materials made and produced in respiration are transported effectively.

The cardiovascular system grade ladder could be used to help complete the task as well as formatively to assess it.