

# EDEXCEL GCSE 2011 SCIENCES

## GCSE & BTEC Links guide

Supporting science, supporting you



# GCSE and BTEC Links – helping you and your students choose the right learning pathway

**There's a great deal of shared content between BTEC Level 2 Applied Science and our new GCSE Science 2011 suite, especially as both are based on the Key Stage 4 programme of study. We've been working on ways this overlap can benefit you, your students and your centre:**

## **1. With our approved BTEC and GCSE links your students achieve their potential by matching their learning styles to the right qualification.**

### **How we support you**

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We will provide:

- a free set of Edexcel approved tasks, which can be used to form evidence for BTEC assignments, and matched to our new GCSE specifications
- free face-to-face and online support delivered by Edexcel experts in both GCSE and BTEC, where you can learn about delivering GCSE and BTEC links
- planning and mapping of common content for teaching units of BTEC before units of GCSE – checked by Edexcel assessors to ensure you cover content appropriate for both learning styles.

### **How this helps you**

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- you can see if your students work better with the GCSE or BTEC approach and delay the decision on moving students completely to GCSE or BTEC route, knowing that we have approved the approach for both Edexcel GCSE and BTEC
- you can cover the teaching and learning in the time available even if you are allowing students to try both approaches early on in your key stage 4 teaching.

## **2. Our single sign-up process (from September 2011) gives you the support at the time you need it, whilst making the most of your budget.**

### **How this helps you**

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Usually, you have to sign up students for BTEC by November to avoid late fees. If you sign up later, it can be hard for us to know what level of support you need and make you aware of the kind of support available – especially if you are running GCSE and BTEC together in one curriculum. This can be a problem if you don't know for sure at the start of Key Stage 4 if a student will suit vocational or academic routes.

*From September 2011, we have a new single sign up process to help with this.*

- Receive the support suited to your combination of BTEC and GCSE students at the time you need it.
- Reduce the risk of late fees because you can register students for BTEC late in Key Stage 4.

## How to register using the single sign-up process

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- 1** Go to [www.edexcel.com/science](http://www.edexcel.com/science) and go to the 'Single sign-up' area.
- 2** Fill in details about your cohort – the number likely to do BTEC Applied Science, Edexcel GCSE Sciences and undecided.
- 3** Register students you are sure are right for BTEC by the usual deadline (*We then work out the level of support you will need and you are registered for the OSCA2 process.*)
- 4** Enter students for GCSE 2011 units as normal. Register them for BTEC at any time during the academic year and no late fees will be payable.

## Delivering the English Baccalaureate and BTEC in one curriculum

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Balancing the new English Baccalaureate (EBacc) against the as yet unchanged 5A\*-C measure that is used to judge if a school is performing at an acceptable level, and providing an education that best suits your students, can be complicated. Our science qualifications can help you meet these demands by keeping your options open to choose the best pathway for your students. Our teaching approaches are designed to be in the best interests of the student, whilst supporting you with our GCSE and BTEC links programme and our 'single sign up'.

- If you want your candidates to work towards an EBacc, having already started them on BTEC, we have validated planning materials to show you how to switch to GCSE Science.
- Alternatively, if you intend to start with Edexcel GCSE Sciences, you still have the option to move students to BTEC and get credit for their learning if they show more interest in vocational studies. This is supported by the engaging and motivating Edexcel approved BTEC links tasks that draw on the BTEC approach to learning. So we are the safest option if you are unsure of some of your cohort's final learning pathway, having validated materials for both BTEC and Edexcel GCSE Sciences.

## Possible scenarios

### Student A's pathway:

Andy is in a school that runs a 3-year Key Stage 4. At the beginning of Year 9, Andy's teacher decides that he is not yet ready to sit modular GCSE examinations, as he needs to develop skills such as independent enquiry and extended writing. Andy's teacher places him in a BTEC class, where in one year, he covers the Key Stage 4 programme of study through taking the BTEC Level 2 Applied Science certificate.\*

During that year, the motivational aspect of BTEC really enthuses Andy and he becomes engaged during science lessons. At the end of Year 9, Andy and his teacher have a choice; he can continue on the assignment-based assessment of BTEC and continue onto BTEC Level 2 Extended Certificate, or Level 2 Diploma in Applied Science, or, if he will be better suited to taking examinations as assessments, he can be moved onto a GCSE programme.

If he moves to GCSE, Andy will have already covered much of the content of the GCSE in Science during his BTEC year. Andy's teacher can consult Edexcel's mapping documentation to work out what parts of the GCSE in Science they will have to revisit before he sits his examinations for this qualification. Andy will then use the rest of the time in Key Stage 4 to go on to complete either GCSE in Additional Science or separate sciences in biology, chemistry and physics.

\*If you are considering running BTEC in Year 9, in order to avoid repetition of content you might want to consider whether a skills-based programme, to introduce the learning style and motivational aspects of BTEC, and based on some of the BTEC optional units, might be more appropriate to your learners.

### Student B's pathway:

Bhavna is in a school that runs a 2-year Key Stage 4. At the beginning of Year 10, Bhavna's teacher places her in a GCSE group. Bhavna's teacher tells Edexcel that the centre is running Edexcel's science qualifications. She also approximates which students will be taking BTEC and which will be taking GCSE.

Bhavna's teacher is unsure which approach (GCSE or BTEC) will suit Bhavna best, so during the course of her GCSE study, Bhavna completes Edexcel's GCSE BTEC tasks. These tasks are relevant to the GCSE programme she is following, but can also be used to form evidence towards BTEC assignments. During the Spring term of Y10, Bhavna's teacher realises that completing the BTEC tasks motivates Bhavna and that the BTEC assessment route would really suit her.

As Bhavna's teacher is using Edexcel's single sign up, she can move Bhavna over to BTEC Level 2 Applied Science without incurring any late fees. And, as a result of completing the tasks, Bhavna has already started to build up some evidence towards the BTEC Level 2 in Applied Science, so there is still enough time to build up enough evidence for a BTEC qualification. Bhavna's teacher slots the work from these tasks into the assignments that Bhavna will eventually use to achieve her BTEC Level 2 Certificate in Applied Science.



## GCSE/BTEC tasks

At the start of Key Stage 4, many science departments are uncertain whether some of their students might benefit most from an academic pathway (e.g. GCSE), a vocational pathway (e.g. BTEC) or a mixture of both.

The following pages contain a small selection of the tasks intended to be used with students who may benefit from the BTEC learning approach, but who you have initially placed in a GCSE class. The tasks match the GCSE specification but can also be used to form parts of BTEC assignments.

This will help you to:

- see if a student works well with the BTEC approach
- get ahead with assignments before you move students to BTEC full time
- delay the decision on moving students or allowing them the option of gaining both a GCSE and a BTEC qualification
- introduce some of the motivational aspects of the BTEC approach to all your students.

Alongside the tasks, we provide an overview sheet, which includes information as to which BTEC assessment criteria are covered by the tasks, which criteria remain to be covered, and any additional guidance which may be useful to you.

The tasks have a GCSE feel to them, but if you eventually use them as part of an assignment, you should ensure that the overall assignment is vocational and suits your students' interests.

The full set of tasks will be available free to all Edexcel GCSE Science centres.



# Sample tasks

The full set of tasks will be available free to all Edexcel GCSE Science centres.  
Email [scienceteamupdates@edexcel.com](mailto:scienceteamupdates@edexcel.com) for details.

## Biology Overview sheet

Please note: all aspects of BTEC L2 Applied Science grading criteria need to be met in order for achievement in BTEC to be recognised.

Sheet	GCSE spec reference	Covers (assuming extension tasks have been successfully completed)	Remaining to be covered to fulfil criteria	Additional guidance
1 (Constructing a Key to Identify Trees Found in Britain)	1.10	Unit 3 P2	No further work if both keys are completed	NB BTEC L2 requires study of a wider variety of living organisms; identification keys; the need to organise/classify; major characteristics of viruses, bacteria, protists, fungi, plants (flowering plants, non-flowering plants), animals (invertebrates, vertebrates)
2 (The Peppered Moth)	1.11 1.12	Unit 3 P3: <ul style="list-style-type: none"> <li>adaptations of one organism</li> </ul> Unit 3 M1	Unit 3 P3: <ul style="list-style-type: none"> <li>adaptations of one further organism</li> <li>interdependence</li> </ul> Unit 3 M1: no further work	Interdependence can be picked up in the spring term. M2 is not covered until the spring term in GCSE Unit B1 content.
3 (Cystic Fibrosis)	1.20-1.26	Unit 3 P1: <ul style="list-style-type: none"> <li>effect of alleles on cell function</li> </ul> Unit 3 P5: <ul style="list-style-type: none"> <li>one internal inherited factor</li> </ul> Unit 3 M4: <ul style="list-style-type: none"> <li>how an inherited factor disrupts body systems to cause ill health</li> </ul> Unit 3 D3: <ul style="list-style-type: none"> <li>social issues arising from the inherited factor</li> </ul>	Unit 3 P1: <ul style="list-style-type: none"> <li>structure and specialisation of cells</li> <li>DNA code</li> <li>chromosomes</li> </ul> Unit 3 P5: <ul style="list-style-type: none"> <li>external factors</li> <li>a second internal factor</li> </ul> Unit 3 M4: <ul style="list-style-type: none"> <li>medical and social factors</li> </ul> Unit 3 D3: <ul style="list-style-type: none"> <li>medical and social factors</li> </ul>	D1 is not covered in GCSE until Unit B2.  This is potentially a longer activity if extension tasks are covered, since it covers many criteria.
4 (Nervous Regulation)	<ul style="list-style-type: none"> <li>2.1</li> <li>9-</li> <li>2.2</li> <li>3</li> </ul>	Unit 3 P6: <ul style="list-style-type: none"> <li>nerves as pathways for electrical signals</li> <li>homeostasis and nervous control</li> </ul>	Unit 3 P6: <ul style="list-style-type: none"> <li>homeostasis and endocrine control</li> </ul>	Tasks 4 and 5 together cover P6 in its entirety.
5 (Diabetes)	<ul style="list-style-type: none"> <li>2.5</li> <li>-</li> <li>2.1</li> <li>3</li> </ul>	Unit 3 P6: <ul style="list-style-type: none"> <li>homeostasis and endocrine control</li> </ul>	Unit 3 P6: <ul style="list-style-type: none"> <li>nerves as pathways for electrical signals</li> <li>homeostasis and nervous control</li> </ul>	Tasks 4 and 5 together cover P6 in its entirety.

## Constructing a Key to Identify Trees Found in Britain

There are many different types of trees in the British countryside, towns and cities. Not all of them are native to this country. In most cases it is possible to identify the type of tree from the shape and features of its leaves.

### Task 1

You need to construct a key that could be used by students on a field trip to identify some types of trees from their leaves. A leaf is described as **simple** if its lobes do not reach the centre vein of the leaf. A compound leaf has several leaflets that join to a stalk. Some key features of leaves are illustrated below.

**You need to choose six leaves from the worksheet to construct your key.**

#### Leaf features



Simple leaf  
Rounder shape  
Slightly toothed edge



Compound leaf  
Leaflets that meet the stalk



Simple leaf  
Rounded lobes



Compound leaf  
Leaflets in pairs with one at the tip  
Leaflets toothed



Simple leaf  
Triangular shape with distinct point  
Toothed edge



Compound leaf  
Leaflets meet stalk at the same point

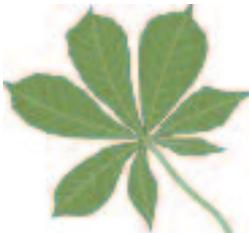
**Extension task:** Use the internet to find ten coloured pictures of arthropods (insects, arachnids, crustaceans or myriapods) and construct a key that could be used to identify the arthropods.

Features you might want to consider when constructing the key could include:

- Number of legs
- Number of pairs of wings
- Number of body parts
- Distinguishing colours or patterns on the body or the wings

Information for teachers – Depending on the access in your centre to IT facilities you might choose for your students to complete only the extension task. Successful completion of either task 1 or the extension task is sufficient evidence for **part** of the BTEC Level 2 criteria from Unit 3 – P2. Successful completion of both task 1 and the extension task would provide sufficient evidence for **all** of the BTEC Level 2 criteria from Unit 3 – P2.

Leaf pictures

			
alder	ash	beech	birch
			
elder	field maple	hawthorn	hazel
			
holly	horse chestnut	oak	rowan
			
sycamore	lime	blackthorn	

## The Peppered Moth

The peppered moth (*Biston betularia*) is a well-known and well-publicised example of natural selection. Prior to the Industrial Revolution the *typica* form of the moth was most common. As a consequence of the Industrial Revolution lichens on tree bark were killed and the bark darkened. As a result the *carbonaria* form of the moth began to appear and became the common form in industrial areas. The burning of cleaner fossil fuels has meant that the levels of the *typica* moth have increased in recent years.



**You could present this work as a leaflet, poster, factsheet, PowerPoint presentation or movie. You will need to use your knowledge from lessons as well as some independent research.**

### Task 1

You need to present information from the peppered moth study to help you describe the adaptations of organisms. To do this you should:

- Find photographs of the two forms of peppered moth in different habitats.
- Explain why the two types of moth are adapted to their habitat.
- Describe some additional features of the peppered moth which show that it is adapted to its environment.

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**Extension task:** It is thought that the increase in the *carbonaria* type of moth after the Industrial Revolution was a result of natural selection. You need to apply Darwin's theory of natural selection to explain how the *carbonaria* type of peppered moth became more prevalent after the Industrial Revolution.

To do this you should:

- Explain Darwin's theory of natural selection.
- Apply this theory to explain how the *carbonaria* moth became more prevalent over time.

Information for teachers – Successful completion of task 1 is sufficient evidence for **part** of the BTEC Level 2 criteria from Unit 3 – P3. Successful completion of the extension task provides evidence for **all** of the BTEC Level 2 criteria from Unit 3 – M1.

## Cystic Fibrosis

Cystic fibrosis affects over 8000 people in the UK and about 1 in 25 people carry the allele for cystic fibrosis. This genetic disease is caused by a mutation in the CFTR gene. The CFTR gene produces a protein that controls the movement of salt and water into and out of body cells. The allele that causes the disease is a recessive allele, which means sufferers must be homozygous for the allele to suffer from the disease.

**You could present this work as a leaflet, poster, factsheet, PowerPoint presentation or movie. You will need to use your knowledge from lessons as well as some independent research.**

### Task 1

People who suffer from cystic fibrosis produce thick, sticky mucus in their respiratory system because the CFTR protein that is produced does not regulate the movement of water and salt. You need to outline how the CFTR gene affects the function of the cells of the respiratory system.

To do this you should:

- Describe what happens in the cells of the respiratory tract in a patient who has cystic fibrosis.
- Compare this to the function of the cells in the respiratory tract of someone who does not have cystic fibrosis.

Note: Details of protein synthesis are not required for this task. The description should be about how the presence of a particular gene can affect the functioning of a cell.

### Task 2

Cystic fibrosis does not just affect the respiratory system.

Describe the symptoms experienced by someone who suffers from cystic fibrosis and the long-term problems that they may encounter.

**Extension task 1:** In addition to the work of task 1 and 2, you need to explain how cystic fibrosis can cause ill health.

For each of the symptoms listed for task 2, explain the effect it has on the body to cause ill health. For example, repeated chest infections can damage the lungs and prevent them functioning properly. You need to explain the effect that cystic fibrosis has on the following parts of the body:

- lungs
- pancreas
- liver
- intestines
- reproductive system

**Extension task 2:** Relatives of people with cystic fibrosis can be heterozygous and carry the allele but not suffer from the disease. However, they need to consider this when having children of their own. You need to explain the social issues that result from suffering from cystic fibrosis or carrying the allele for it.

To do this you should explain:

- The inheritance of cystic fibrosis when both parents carry the allele for the disease.
- The effect that suffering from cystic fibrosis has on a person's fertility.
- The possible inheritance pattern of the disease from a parent who has cystic fibrosis.

Information for teachers – Successful completion of task 1 is sufficient evidence for **part** of the BTEC Level 2 criteria from Unit 3 – P1. Successful completion of task 2 would provide sufficient evidence for **part** of the BTEC Level 2 criteria from Unit 3 – P5. Successful completion of extension task 1 is sufficient evidence for **part** of the BTEC Level 2 criteria from Unit 3 – M4. Successful completion of extension task 2 is sufficient evidence for **part** of the BTEC Level 2 criteria from Unit 3 – D3.

## Nervous Regulation

Our bodies have many mechanisms that help us to maintain optimum health. In some cases these control mechanisms act very quickly to prevent damage to our bodies that could cause illness or death. Alternatively these control mechanisms can act for a longer period of time. To maintain optimum health our bodies need to ensure that we have a constant internal environment, for example, body temperature.

**You could present this work as a leaflet, poster, factsheet, PowerPoint presentation or movie. You will need to use your knowledge from lessons as well as some independent research.**

### Task 1

If you touch something hot a reflex reaction will cause you to pull your hand away quickly. You need to describe the pathway for electrical signals involved in this reflex arc.

To do this you should:

- Describe the role of the receptor, central nervous system and effector.
- Give the names of the neurones involved in the reflex arc.
- Describe the route the electrical signal takes along these neurones.

**Extension task:** The reactions in our body cells work best at 37°C. When we exercise we produce heat which we have to remove from our body. When we are very cold we need to retain heat. Our bodies have to maintain a constant body temperature of 37°C. This is an example of homeostasis. You need to explain how the body keeps a constant temperature.

To do this you need to explain

- how the body gets rid of excess heat produced by exercise
- how the body retains heat when in a very cold environment

Information for teachers – Successful completion of task 1 is sufficient evidence for **part** of the BTEC Level 2 criteria from Unit 3 – P6. Completion of the extension task provides further evidence for the BTEC Level 2 criteria from Unit 3 – P6.

## Diabetes

Diabetes can be caused when the body does not produce the hormone insulin. Insulin is responsible for lowering the level of glucose in the blood. Too much glucose in the blood is called hyperglycaemia and can cause symptoms such as headaches, increased thirst and blurred vision. In the long term it can cause damage to nerves. Too little glucose in the blood is called hypoglycaemia and can cause symptoms such as confusion, weakness and trouble speaking. In the long term it can cause a diabetic coma.

**You could present this work as a leaflet, poster, factsheet, PowerPoint presentation or movie. You will need to use your knowledge from lessons as well as some independent research.**

### Task 1

You need to explain how the body controls the level of sugar in the blood.

To do this you should:

- List some foods that significantly raise the blood sugar level.
- Describe how a healthy person brings a raised blood sugar level back to normal.
- Describe how a healthy person brings a low blood sugar level back to normal.
- Explain how diabetics regulate their blood sugar level.

Your answers should include details about where insulin is produced, how it travels around the body, and how and where excess glucose is stored in the body.

Information for teachers – Successful completion of task 1 is sufficient evidence for **part** of the BTEC Level 2 criteria from Unit 3 – P6.

# EDEXCEL GCSE 2011 SCIENCES

## Supporting science, supporting you



There are real advantages to being able to offer your students a choice of either a GCSE or BTEC learning pathway. This guide shows you how we support you and how simple we've made it to give students the opportunity to move between the two pathways. So, if you're considering teaching (or are already teaching) both GCSE and BTEC Level 2 Applied Science, take a look inside to see how our qualification links, task setting, and single sign-up process help you to do this.

We've listened to science teachers and the wider science community, ensuring the development of a new suite of GCSE science qualifications that:

- puts good science at the heart of teaching, learning and assessment
- is presented in clear and detailed specifications
- has examination papers designed and trialled to be accessible to all, with appropriate stretch for your able students
- provides clear and manageable controlled assessments
- has an achievable approach to practical work.

**For further information please visit [www.edexcel.com/science2011](http://www.edexcel.com/science2011)**

**or contact our Subject Advisor Team at:**

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