

PROVISIONAL



TRANSITION GUIDE

Topic: Cell Level Systems

October 2015

GCSE (9–1)

Gateway Biology A

KS3–KS4



We will inform centres about any changes to the specification. We will also publish changes on our website. The latest version of our specification will always be the one on our website (www.ocr.org.uk) and this may differ from printed versions.

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This resource is an exemplar of the types of materials that will be provided to assist in the teaching of the new qualifications being developed for first teaching in 2016. It can be used to teach existing qualifications but may be updated in the future to reflect changes in the new qualifications. Please check the OCR website for updates and additional resources being released. We would welcome your feedback so please get in touch.



Welcome

Welcome to the KS3–KS4 Transition Guide for **GCSE (9–1) Gateway Biology A.**

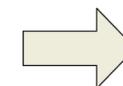
Key Stage 3 to 4 Transition Guides focus on how a particular topic is covered at the different key stages and provide information on:

- Differences in the demand and approach at the different levels
- Useful ways to think about the content at Key Stage 3 which will help prepare students for progression to Key Stage 4
- Common student misconceptions in this topic.

Transition guides also contain links to a range of teaching activities that can be used to deliver the content at Key Stage 3 and 4 and are designed to be of use to teachers of both key stages. Central to the Transition Guide is a Checkpoint task which is specifically designed to help teachers determine whether students have developed deep conceptual understanding of the topic at Key Stage 3 and assess their 'readiness for progression' to Key Stage 4 content on this topic. This checkpoint task can be used as a summative assessment at the end of Key Stage 3 teaching of the topic or by Key Stage 4 teachers to establish their students' conceptual starting point.

Key Stage 3 to 4 Transition Guides are written by experts with experience of teaching at both key stages.

[Go to topic comparison](#)



Key Stage 3 Content

Key Stage 3 National Curriculum Content

- cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope
- the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts
- the similarities and differences between plant and animal cells
- the role of diffusion in the movement of materials in and between cells
- the structural adaptations of some unicellular organisms
- the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms.



Key Stage 4 Content

GCSE Content

- Describe how light microscopes and staining can be used to view cells
- Explain how the main sub-cellular structures of eukaryotic cells (plants and animals) and prokaryotic cells are related to their functions.

DNA and protein Synthesis

- Describe DNA as a polymer... forming a double helix. There are four different nucleotides; ... of a sugar and phosphate group
- **Recall a simple description of protein synthesis and explain simply how the structure of DNA affects the proteins made in protein synthesis.**

Respiration

- Describe cellular respiration
- Compare the processes of aerobic and anaerobic respiration.

Metabolism

- Explain the importance of sugars, amino acids and fatty acids and glycerol in the synthesis and breakdown of carbohydrates, proteins and lipids.

Enzymes

- Describe experiments that can be used to investigate enzymatic reactions
- Explain the mechanism of enzyme action.

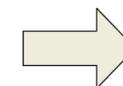
Photosynthesis

- Describe the process of photosynthesis
- Describe experiments to investigate photosynthesis
- Explain the effect of temperature, light intensity and carbon dioxide concentration on the rate of photosynthesis
- **Explain the interaction of these factors in limiting the rate of photosynthesis.**



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Explore the Guide





KS3



KS4

Comment

Possible Teaching Activities (KS3 focus)

Checkpoint Tasks

Possible Teaching Activities (KS4 focus)

Possible Extension Activities (KS4 focus)

Resources, links and support

Comment

Differences in the demand from Key Stage 3 to Key Stage 4

Students' knowledge gained at KS3 of animal and plant cells and the different types of specialised cells is built on at Key Stage 4. All students should know the basic functions of the different cells and at Key Stage 4 they are expected to link the adaptations of the specialised cells to their functions.

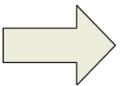
At Key Stage 4 students also need to understand DNA as a polymer made from four different nucleotides, each nucleotide consisting of a common sugar (deoxyribose) and phosphate group with one of four different bases (adenine, cytosine, guanine and thymine) attached to the sugar. The sequence of bases in DNA codes for the proteins and that genes instruct a cell how to make proteins from amino acids. This builds on the knowledge gained at Key Stage 3, as students were expected to understand the basic idea of inheritance being passed from one generation to the next in the form on DNA. Higher ability students are also expected to understand the process of protein synthesis using the genetic code.

Photosynthesis is covered in much more detail at Key Stage 4. Not only do students need to be aware of the process, which they learned at Key Stage 3, but they need to explain the specific effects of temperature, light intensity and carbon dioxide concentration on the rate of photosynthesis. Students should be aware of the interaction of these factors in limiting photosynthesis.

Enzymes are a fairly untouched area of study at Key Stage 3 which is studied in much more detail at Key Stage 4. Students need to understand the mechanism of enzyme action. They should know how enzymes work and what factors affect them. A series of investigations is usually a great way to look at these factors.

Respiration as a concept may have only been lightly touched upon at Key Stage 3. At Key Stage 4 students need to describe cellular respiration and they need to understand the processes of aerobic and anaerobic respiration.

Next





GCSE (9–1) Gateway Biology A

KS3–KS4 Transition Guide

KS3



KS4

Comment

Possible Teaching Activities (KS3 focus)

Checkpoint Tasks

Possible Teaching Activities (KS4 focus)

Possible Extension Activities (KS4 focus)

Resources, links and support

Comment

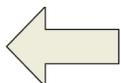
Challenges students face when tackling this topic at GCSE

Students often have difficulty understanding the concept of a cell as a 3D structure, so this should be addressed during the teaching of this topic. The use of models instead of just 2D images could prove useful.

Many students have the misconception that all enzymes have an optimum temperature of 37°C (human body temperature). The range of optimum temperatures of enzymes should be introduced through the teaching of this topic. A series of different investigations could be a good approach for students to understand the effects of temperature on enzymes.

A common difficulty students face is the misconception that ventilation is respiration. It is often useful to link cellular respiration after photosynthesis. Work through the equation of photosynthesis and then using the products link into cellular respiration. It is then possible to make students aware of how humans get the raw ingredients for respiration; oxygen (through ventilation) and glucose (from digestion), then they can often see the distinction between ventilation and respiration. This should then give a strong foundation to look at the differences between aerobic and anaerobic respiration.

Previous



Topic: Cell level systems

KS3



KS4

Comment

Possible Teaching Activities (KS3 focus)

Checkpoint Tasks

Possible Teaching Activities (KS4 focus)

Possible Extension Activities (KS4 focus)

Resources, links and support

Possible Teaching Activities (KS3 focus)



Cells to Systems

BBC Bitesize KS3

This is a really useful interactive tool. It summarises the organisation of cells to tissues to organs to organ systems both in animals and plants. There are interactive tasks and test questions to check understanding. It could be done as an individual task or as mini quiz material by the teacher to the whole class.

Resources: http://www.bbc.co.uk/bitesize/ks3/science/organisms_behaviour_health/cells_systems/activity/

Click here to view page



Biology – Cells – The building Blocks of Life

Collins

Biology - Practice Questions Q1-3 page 14. These questions provide a really useful summary activity. It could even be given as a mini assessment task.

Resources: <http://resources.collins.co.uk/Samples/Collins%20KS3%20Science/combined.pdf>

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Designed for the Job

TeachItScience

What does each cell do? This resource is great for looking at specialised cells their role and the adaptations that aid that function. There is a student sheet and an answer sheet.

Resources: <http://www.teachitscience.co.uk/index.php?CurrMenu=2130&resource=19384>

Click here to view page



These are a useful set of diagrams that could be used for students to label and annotate when learning about diffusion.

Resources: <http://www.teachitscience.co.uk/index.php?CurrMenu=2130&resource=19665>

Click here to view page



Simple either starter or plenary activity.

Resources: <http://www.teachitscience.co.uk/index.php?CurrMenu=2130&resource=19383>

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KS3



KS4

Comment

Possible Teaching Activities (KS3 focus)

Checkpoint Tasks

Possible Teaching Activities (KS4 focus)

Possible Extension Activities (KS4 focus)

Resources, links and support

Checkpoint Tasks



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The checkpoint activities are a selection of sheets designed to check the key areas from Key Stage 3 before moving forward to Key Stage 4. The activities can be done individually or together.

Activity 1 Similarities and differences comparison between plant and animal cells.

This could be done as a teacher led activity using mini white boards and getting the students to draw the two different cells (with labels) followed by a class discussion to complete a comparison table on the class white board.

The activity could also be run using the sheets provided.

Activity 2 Specialised cells match up activity.

This activity is a simple cut and stick activity for pupils to complete individually.

Activity 3 Summary word loop game.

This is a large group activity. The card sheet should be cut in advance of the lesson, fold along the central line and glued. Each student should be given a card and the students should stand in a large circle. It works well if the teacher has the first card of the sequence and therefore they start off. Students should use their knowledge to work out whose card is next. Continue the loop game until all of the cards have been used.

<http://www.ocr.org.uk>

KS3



KS4

Comment

Possible Teaching Activities (KS3 focus)

Checkpoint Tasks

Possible Teaching Activities (KS4 focus)

Possible Extension Activities (KS4 focus)

Resources, links and support

Possible Teaching Activities (KS4 focus)



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Biology animations - transport of water and sugar, respiration and photosynthesis and growth in plants

Science and Plants for Schools (SAPS)

The Plant Biology animation shows many key processes within the context of a whole organism: - respiration and photosynthesis, growth of plants and the transport of sugar and water. It is good for reminding students that the different processes are interrelated. The animations can be viewed separately if desired.

Resources: <http://www.saps.org.uk/secondary/teaching-resources/1299-biology-animations-plant-transport-photosynthesis-and-cell-growth>



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Respiration card sort

TeachItScience

Respiration card sort activity. All the card sheets (will need to be cut out) and teacher notes are included. This resource is ideally suited for consolidating learning.

Resources: <http://www.teachitscience.co.uk/index.php?CurrMenu=2182&resource=23320>



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Proteins and enzymes

BBC Bitesize KS4

This could be a useful interactive resource. There are interactive tasks and test questions to check understanding. It could be done as an individual task or as mini quiz material by the teacher to the whole class.

Resources: http://www.bbc.co.uk/schools/gcsebitesize/science/add_aqa/proteins/digestionact.shtml



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Enzyme practicals

Biology Experiments

A useful website for biology experiments. Under the Enzymes section there are 3 practicals worth considering: 2. Effect of temperature, 3. Effect of pH and 5. Effect of enzyme concentration. Each of these gives preparation notes, instructions for the practical and discussion questions with answers (on a separate resource).

Resources: <http://www.biology-resources.com/biology-experiments2.html>

KS3



KS4

Comment

Possible Teaching Activities (KS3 focus)

Checkpoint Tasks

Possible Teaching Activities (KS4 focus)

Possible Extension Activities (KS4 focus)

Resources, links and support

Possible Extension Activities (KS4 focus)



Protein synthesis activities

TES.co.uk - beccaboobahbay

The 'Understand' sheets can be used by students to illustrate the stages of protein synthesis (and add keywords) or (if they feel more confident) write the captions for the already illustrated comic strip. The 'Be able to' activity is for students to practice working out the amino acid sequence from the DNA sequence. Extension questions included.

Resources: <https://www.tes.co.uk/teaching-resource/Protein-synthesis-activities-6291262>

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Photosynthesis Limiting Factors

Noadswood Science Resources

Useful PowerPoint presentation for introducing limiting factors of photosynthesis to students. Lesson 6 and 7 – Photosynthesis Limiting Factors. Along with outlining what a plant needs for photosynthesis there is an experiment and a data set to work with. It clearly outlines the different limiting factors of photosynthesis and illustrates the shapes of the graphs for each that students need to be aware of.

Resources: http://noadswood.hants.sch.uk/science/noadswood_science_website/GCSE_Additional_Science_-_Biology_1.html

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KS3



KS4

Comment

Possible Teaching
Activities (**KS3 focus**)

Checkpoint Tasks

Possible Teaching
Activities (**KS4 focus**)

Possible Extension
Activities (**KS4 focus**)

**Resources, links and
support**

Resources, links and support



**Additional
Topic 1**



**Additional
Topic 2**



**Additional
Topic 3**

As we develop Transition Guides for further topics we'll update these links, making it easy for you to browse all the guides for your chosen subject.



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