

AS and A-level Biology

Key skills and knowledge booster

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Biology and its Applications

Introduction – from the authors

About the Key Skills and Knowledge Booster Series

We have developed this series based on our own teaching, to enable students undertaking science AS and A-levels to experience a smoother transition from GCSE to AS and A-level.

Students often find this transition very difficult and can easily become overwhelmed by the new subject knowledge they meet, which is often abstract, and the level of understanding required. It is not uncommon for students to find themselves in the unenviable position of failing early exams or gaining grades that lead to them to become despondent with the subject or reconsider their subject choices.

The tasks outlined in this series aim to cover areas of common misconceptions in the main science AS and A-levels of biology, chemistry and physics, and to aid teachers in their delivery of underpinning concepts, such as general maths skills or practical skills, needed for each subject. The newly updated A-level science curricula place a far greater emphasis on these underpinning skills and, for this reason, each of the books in the Key Skills and Knowledge Booster series has had extra tasks added to ensure that teachers can provide as much support as possible to students with these skills.

Due to the wide number of GCSE specifications covered by students, it is impossible for all students to begin their A-levels with identical background knowledge, and there will always be huge variability in the grades students have achieved in their GCSE exams. Both of these factors can have an impact on the delivery of the A-level syllabus and, ultimately, on the success of students. At the time of writing, the new GCSE science curriculum was in the process of being finalised. This curriculum also places an emphasis on underpinning skills, including maths, and has introduced new topics within each of the three subjects. Extra tasks have been added so that teachers can check students' understanding of these areas. This will be of particular importance when teaching students who have moved from the old GCSE specifications, as it will highlight areas that were not covered but which are expected to be commonplace as students progress through their science studies.

The Key Skills and Knowledge Booster Series has been developed to complement your existing teaching. It has not been written to meet any particular A-level specification, rather to cover general areas within each subject that we have found anecdotally to give rise to problems for students. These tasks are not intended to replace your existing text books or to act as a stand-alone teaching guide.

What the Key Skills and Knowledge Booster series contains

A separate book has been produced for biology, chemistry and physics. Each title is broken down into the following sections. Ideas on how you may wish to use each type of task, within your own teaching, have been shown in italics.

- **GCSE Checker Tasks:** these tasks can be used to get an overview of GCSE knowledge that students have.

These could be used as an induction exercise to ascertain students' background knowledge and highlight areas that students will need to revise, or they could be combined to form an induction test.

- **Basic Skills for the AS and A-level Student:** these tasks give instructions and guidance to students on skills they will need throughout their A-levels, such as essential maths skills. We have found that maths skills, or confidence in particular, is often an area that causes many problems, especially if students are not following A-level courses in maths. These tasks aim to cover some of the gaps in knowledge that students may have.

These could be used at the beginning of the AS year to bring students up to a basic level in skills such as graph plotting, using calculators or using scientific notation. They can also be given to students if work they are completing throughout the year shows they have weaknesses in certain areas, for example rearranging equations.

- **Investigation Skills for the AS and A-level Student:** these tasks outline key practical skills or techniques that students will need in order to access their specific A-level syllabus; they form an excellent bank of resources that students could refer to in order to remind themselves of practical techniques, or skills that they may need to use time and time again. These will complement the teaching around any investigations or assessed practical activities that students may need to complete.

These could be used when introducing a new practical technique, such as dilution and biochemical tests, the run-up to practical exams or to aid in-depth investigations.

- **Topic Builders:** these tasks lead students through the topics that, in our experience, students find the most difficult to comprehend. They have been written in as simple a manner as possible to try to support students through topics and to steer them away from forming misconceptions. Where possible, simple analogies have been included to help students overcome the abstract nature of some of the topics. These tasks include a 'taking it further' section that allows students to consolidate what they have covered and to go on and extend their understanding, once they have grasped the essential points and are feeling more confident with the topic.

These can be given to students who are struggling with specific concepts. They could be used as individual self-study exercises, homework, material to work through in tutorials or within small group settings.

- **Biology and its Applications:** these tasks are open ended and research based. They encourage students to consider how the subject they are studying impacts on everyday life, industry or perhaps the world of academic research. Students can become so focused on what they need to know for exams that they lose sight of what the subject they are studying is all about; these tasks allow students to become enthused on topics and may (hopefully) lead to interest in studying the subject further.

These could be used throughout the year, perhaps as homework, research tasks or extension work.

- **Accompanying CD:** this contains a copy of the entire book plus answers to the tasks. The CD files can be used either to project the tasks onto a whiteboard, or to print off relevant pages for individual students.

The tasks in the first four sections all contain questions or tasks for students to attempt to check their understanding. Answers (contained on the CD) have been provided for self-marking. Where necessary, 'workings out' have been shown to help students check through, and learn from, their answers. Key words and terms have been shown in bold throughout the tasks contained in the books to help students identify words or phrases they should know and be able to define or interpret.

Who is the Key Skills and Knowledge Booster series aimed at?

The tasks have been written predominantly for first-year A-level students, although some of the tasks will be relevant to both AS- and A2-level students. The tasks would be very suitable for students who are finding the transition from GCSE-level science into A-level difficult.

They have been written with students in mind who are achieving grades lower than a C in homework or exams; they are designed to assist these students to fill gaps in their background knowledge or subject-specific knowledge.

Not all students will find all topics difficult, so the tasks can be used as and when required for any student, to help 'top-up' understanding when they meet an area of study they find more difficult.

The series would also be an excellent resource to use with students who miss lessons due to illness or university visits, for example. The tasks would also be an excellent resource to give to students as preparation to be completed prior to, or during, personal tutorials or group seminars.

When do I use the Biology tasks?

The tasks do not need to be used in a sequential order; they can be used as and when they are suitable within your own specification. Nor does each of the tasks need to be used – the book forms a resource bank that can be dipped in and out of.

About the author

Dr Harjit K Singh is an experienced teacher and has taught biology, chemistry and psychology up to A-level as well as BTEC Forensic Science. She has taught AS/A2 Biology and IB Biology and has presented many CPD courses for teachers as well as biology student revision conferences and online web conferences. She has a wealth of experience as an examiner in AS/A2 Biology and IB specifications, and in writing biology resources.

Vocabulary

It is very important that you are able to use scientific vocabulary accurately. There are many biological terms that you will be familiar with from your GCSE science course and it is now essential that you can understand and use them appropriately. Complete the following task and questions, and then compare your results with the Answers. Revise any areas where you have made mistakes.

Task

Use the biological terms below to complete the definitions in the table. Some terms have not been included to provide an extra challenge.

tissue photosynthesis cytoplasm living organisms high homeostasis internal concentrated	enzyme active transport DNA diffusion protein identical similar	bacteria nucleus active site low dilute water chain
--	--	--

Scientific word	Definition
Activation energy	Energy needed to make a reaction take place
.....	Place on the enzyme molecule where the substrate fits
A..... t.....	Movement of substance against a concentration gradient requiring
.....	A single-celled micro-organism with no nucleus
Cell	Fundamental building block of
Chromosome	Made up from, found in the nucleus
C.....	Found in all living cells where chemical reactions take place
Denatured	When the shape of an enzyme molecule changes so it is not able to function
D.....	Net movement of molecules from an area of concentration to one of concentration
E.....	Biological catalyst that the rate of reaction
Food	Feeding relationship between different organisms in an ecosystem
Gene	A part of DNA that codes for a
H.....	Maintaining a constant environment
Mitosis	Cell division in which two daughter cells are produced
N.....	An organelle that contains the genetic material and controls cell activity

(Continued)

Vocabulary

Scientific word	Definition
Osmosis	Diffusion of from a to a more solution
P.....	Process carried out by in which light is used to produce glucose
Respiration	Process where g..... is broken down to provide energy in all cells
T.....	A group of cells that have a structure and function

Questions

- 1 Where in the cell do the chemical reactions take place?
- 2 In which process is light energy used to produce glucose?
- 3 Define the term 'respiration'.
- 4 What is a gene?
- 5 What is the term used to describe the loss of function by enzymes?
- 6 What is tissue made up of?

Plant and Animal Cell Structure

Cells are the basic building blocks of all living things. There are many similarities and differences between plant and animal cells that you would have studied in your GCSE science course. Complete the following tasks and questions.

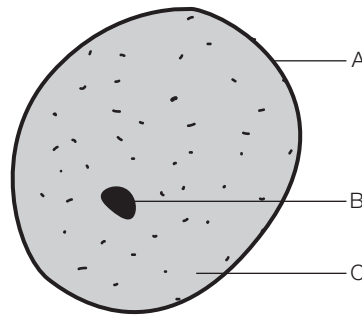
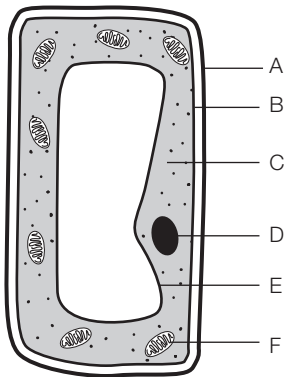
Task 1

Complete the table below, stating the function of each feature. Tick (✓) which cell type the feature is present in and place a cross (✗) where it does not exist.

Feature	Function	Plant	Animal
Cellulose cell wall			
Cell (plasma) membrane			
Nucleus			
Cytoplasm			
Large permanent vacuole			

Task 2

Label the plant and animal cells below.



Questions

- 1 What structures are usually present in all cells, whether plant or animal?
- 2 Which cell structure is responsible for controlling the entry and exit of substances into and out of the cell?
- 3 What structures are only present in palisade cells?
- 4 Which process occurs in the chloroplast?
- 5 State the function of the nucleus.
- 6 Where in the plant cell would you find cell sap?
- 7 What is the function of the cellulose cell wall?
- 8 Where in the cell do most of the chemical reactions take place?

Biological Molecules

Different types of food are needed in correct amounts to maintain a healthy body. The main food groups are **carbohydrates**, **lipids** and **proteins**.

Complete the following task and questions.

Task

Complete the table below by placing a tick (✓) if the statement is correct for each food group or a cross (✗) if incorrect.

Statement	Carbohydrates	Lipids	Proteins
Major component found in the plant cell wall – cellulose			
Provides thermal insulation			
Can be either found as fats (animals) or oils (plants)			
Needed to build up muscles in animals			
Main compound used in respiration			
Amino acids are the building blocks			
Made up of fatty acids and glycerol			
Examples include enzymes, hormones and haemoglobin			
Includes glucose, sucrose and starch			
Denature/break down at high temperature			

Questions

- 1 Name the compound that is the source of energy in respiration.
- 2 What are built up from amino acids?
- 3 Which compound serves as a reserve source of energy in plants and animals?
- 4 What has a structural role in the plant cell wall?
- 5 List two functions of lipids.
- 6 What compound is made up of glycerol and fatty acids?
- 7 This forms compounds that carry oxygen in the blood.
- 8 Name the storage molecule found in plant cells.