Welcome to GCSE success

Key features

You can use this book to help you revise before the examination.

But you can also use it throughout your course:

- to help you to sort out work that you have just completed in a lesson
- at the end of a topic to check that you have understood the key ideas.

When you have drawn up a revision plan before the exams make sure you build in time to use this book.

Good luck!

Janet Major Michael Major

Janet and Michael Major

This book is organised into sections covering coursework and topics. The topics cover Life Processes and Living Things (Biology), Materials and their Properties (Chemistry) and Physical Processes (Physics)

How will the coursework section help?

You'll find an explanation of the points that you need to think about when you are planning, carrying out and making conclusions about your practical work.

How is each section organised?

Each section is divided up into a number of related topics, for example:

Section:	Transporting substances to cells
on topics:	Breathing and Respiration
	Circulation
	The movement of substances in plants

(Each topic contains many examination questions and answers are given to all of these)

The end of the section contains three extra aids to help with revision. These are shown on the next page.

The index

There is an extensive index at the end of the book. Try it out by looking up some words that you know, then try and get into the habit of using the index regularly.

Good design for ease of revision

Photosynthesis

What is photosynthesis?

Plants make their food from carbon dioxide and water. Light is also needed for this reaction – hence the name *photo* (light) – *synthesis* (making complex substances, like sugar, from simpler ones). Plants can grow without soil as long as they can get these raw materials.

It is important to note that plants do not take in food from the soil. They do take in minerals in solution. These are used to make proteins, for example.

This equation is a summary of photosynthesis:

raw materials products

endothermic reaction energy is absorbed

Notice that the light and chlorophyll are written on the arrow.

The green chlorophyll enables the energy in the light to be transferred to the glucose.

Testing a leaf for starch

Some of the glucose made by the leaf is turned into starch (a polymer made up of glucose molecules).

Fig 1. Soil is not needed for plant growth.

This is a good storage product for the cells, because it is insoluble and cannot easily be taken to other cells or affect the water balance in the cell (see p 20). There are three ways you can see whether photosynthesis is happening in plants:

1. Starch test – this involves killing a part of the plant.

2. Collecting the oxygen given off – the process can be watched in a living plant. It is easier with an aquatic plant like the pondweed *Elodea*.

3. Using hydrogen-carbonate indicator – the process can be watched in a living plant. Again it is easier with an aquatic plant like the pondweed *Elodea*.

Hydrogen-carbonate indicator is an orange solution when it has been freshly made. It turns red when carbon dioxide is taken away and yellow when carbon dioxide is added.

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Key facts for the exam

Helpful cross-referencing

Real GCSE questions
Cover up the answer and try the question yourself. It's best to write the answer out, imagining you are in the exam! Notice how many marks are available.

30 work out science • key ideas in living processes

- Carbon dioxide needed for photosynthesis passes into the leaf through the stomata. This diffuses through the air spaces to the palisade cells.
- chlorophyll
- Moving the plant near the window increases the intensity of the light so this increases the rate of photosynthesis.
- Moving the plant to a colder room decreases the rate of the chemical reaction in photosynthesis.
- carbon dioxide, oxygen

What does the plant do with the glucose that it makes?

- transported to other parts of the plant in the form of sucrose.
- used in respiration, to provide the plant cells with energy for carrying out other chemical reactions.
- turned into fat and oils as an 'energy store'.
- used to make cellulose cell walls.
- used (along with nitrogen and sulphur) to make amino acids and then proteins, which the plant needs for growth and repair.

QUESTION

This question, like many questions about photosynthesis, also asks about respiration. If you need to revise this topic look on p 47 to p 50.

Fig 18 shows a vertical section through a leaf.

a. What gas is represented by X? (1 mark)

b. What gas is represented by Y? (1 mark)

c. Name two ways that stomata use the energy released in respiration. (2 marks)

d. State one way that plants use the energy released during respiration. (1 mark)

e. State two ways that stomata use the energy released in respiration. (2 marks)

f. Fig 19 shows the average rate of the leaves of plants of the same age. Some had grown in the shade and some in the light.

g. Explain these observations. (2 marks)

h. Explain these observations. (2 marks)

i. Explain these observations. (2 marks)

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The questions are where you need them, just after the key facts you've been checking

Answer: use this to check your answer. Read carefully any comments – they will help you to get all the marks

Useful diagrams

Revision sheets (and answers) for each topic in the section

Student answers, with comments, completed under examination conditions

Check your answers against those given. If you get an answer wrong, try really hard to see just why you made the mistake

Marks and comments show you why the student lost marks

Straightforward questions show you what you know about a topic

Longer questions for you to try. Answers are given for you to compare an ideal response with your own

Revision sheet

Energy resources

1. Describe what is meant by each of these forms of energy: chemical, electrical, gravitational potential, kinetic, nuclear, thermal.

2. Give two examples of each of the following types of energy source:

a. Renewable

b. Non-renewable

3. Give the main stages which occur at a power station to turn the energy in fuel into electrical energy.

4. Explain this sentence about energy transfer: At the end of the energy transfer there must be...

5. Why is no energy transfer 100% efficient?

6. Finish these equations:

a. Efficiency = $\frac{\text{useful energy transferred}}{\text{total energy supplied}} \times 100\%$

b. Efficiency = $\frac{\text{useful work done}}{\text{total work put in}} \times 100\%$

7. Is a Sankey diagram, to show energy transfer, what does the width of each arrow tell you?

Energy and temperature

1. What is meant by the total internal energy (of a substance)?

2. Finish this equation: Energy transfer = mass $\times$ $\frac{1}{2}$ $\times$ $\frac{1}{2}$

3. Why do solids expand when they are heated?

4. Explain how a bimetal strip works.

5. Put these in order of how much they usually expand, beginning with the one that expands least: liquid, solid, gas.

6. Explain and give an example for each of the following:

a. Conduction

b. Convection

c. Radiation

7. Complete the following:

a. Surfaces are good radiators while surfaces are poor radiators.

b. Surfaces are good absorbers of radiation while surfaces are poor absorbers of radiation.

c. Surfaces are good reflectors of radiation while surfaces are poor reflectors of radiation.

d. List four things you can check to make sure that your home is well insulated.

Revision sheet answers

Energy resources

1. Chemical – energy which is available when bonds are broken and made in a chemical reaction.

Electrical – a flow of electrons forming an electric current.

Gravitational potential – energy given to an object when it is lifted up.

Kinetic – energy in moving objects.

Nuclear – energy available when the nucleus of an atom splits up (fission).

Thermal – energy transfer between a hot and cold object (often called 'heat').

2. Renewable: gravitational, hydroelectricity, solar, tides, waves, wind, wood. Non-renewable: coal, gas, nuclear, oil.

3. Fuel heats water → steam turns turbines → turbines turn generators → generators produce electricity.

4. At the end of an energy transfer there must be as much energy as there was before the transfer.

5. Some energy is always transformed (lost) into the surroundings making them warmer.

6. a. useful energy transferred

b. work put into a machine

7. How much energy is being transferred in each way

Energy and temperature

1. Total energy of all the particles in a substance.

2. Energy transfer = mass $\times$ specific heat capacity $\times$ change in temperature

3. a. The particles have more energy and vibrate more and push further apart.

Revision

Points for passing

Point 1

Well in advance of the examination check that you do not have big gaps in your notes - for example, have you missed any topics? If you find a gap, try and understand the topic using this book. If you are still unsure ask someone to help, preferably your teacher. It might be a good idea to talk to a classmate about this - talking about the topic will help both of you.

Point 2

Be honest with yourself. As you use this book and study the many questions it contains, try to really understand and learn as you go along. Telling yourself that you understand when you don't is not clever.

Point 3

Pace yourself when revising. Don't try and do too much at once. It is a good idea to choose a topic and revise it thoroughly so you feel you have completed it. If you sit down for an hour and try to revise without an aim in mind you are less likely to spend your time wisely.

Point 4

Be active in your revision. Ask yourself questions all the time - for example, 'What do I know about photosynthesis?' You can do this in any spare moment. Or try to persuade someone at home to help you. Many of the sections in this book have questions as headings. See if you can give a sensible answer to the question before reading what it says below. Attempt the exam questions before looking at the answers. But don't be tempted to copy out the book - asking yourself questions is far more useful.

Point 5

Apart from being confident that you understand the basic ideas of the subject, there are certain general things that you should be able to do if you are aiming for higher grades. For example:

- link ideas about animals and plants, such as describing the passage of a nitrogen atom from a fallen leaf through to urine, explaining what is happening at each stage.
- balance symbolic equations.
- re-arrange formulae, which is particularly important in physical processes.

Don't lose your head in the exam room

Point **1**

In the actual examination read each question carefully. It is a common mistake to re-write the question as the answer.

Point **2**

Look for key words in the question, such as **describe** and **explain**. If the question asks you to explain, it wants a reason - not just a simple statement. It may help to highlight words like this during the examination.

Point **3**

It is likely that the question will indicate how many marks are available. Make sure that you have included sufficient scientific detail to achieve these

marks. Remember that if the question is set in context, for example it asks about the properties of a babies' nappy, the examiner is still looking for a scientific answer - not something in 'everyday speak' that someone could guess.

Point **4**

Write clearly and precisely; you are likely to be awarded some marks for spelling, punctuation and grammar.

Point **5**

Try to produce a well presented examination paper. The examiner will have lots of papers to mark and it will give him or her pleasure to read clear, scientifically accurate and thoughtful answers.

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Remember to check your syllabus
number with your teacher!

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Work Out Science GCSE

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