

Published for  
**OXFORD INTERNATIONAL  
AQA EXAMINATIONS**

# International GCSE **BIOLOGY**

## Revision Guide

Jo Locke  
Jessica Walmsley  
Editor:  
Primrose Kitten  
Elizabeth McCullough



**OXFORD**

# Contents



Knowledge



Retrieval



Practice



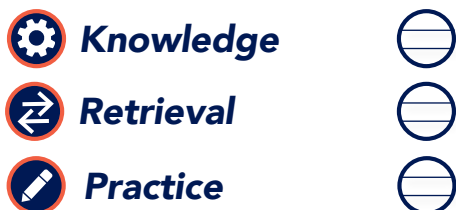
Shade in each level of the circle as you feel more confident and ready for your exam.

## How to use this book

iv

### B1 Cell biology

2



Knowledge



Retrieval

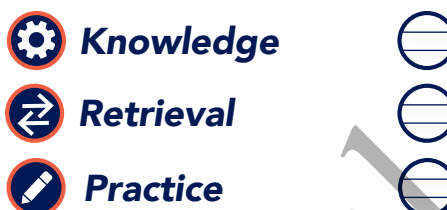


Practice



### B6 Enzymes and digestion

60



Knowledge



Retrieval

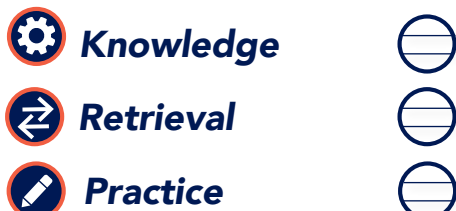


Practice



### B2 Cell transport

12



Knowledge



Retrieval



Practice



### B7 Photosynthesis

72



Knowledge



Retrieval

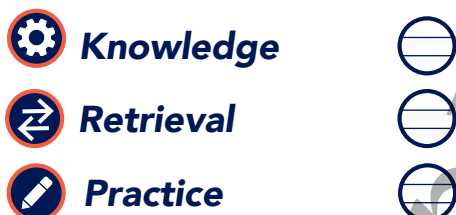


Practice



### B3 Organisation in animals

24



Knowledge



Retrieval

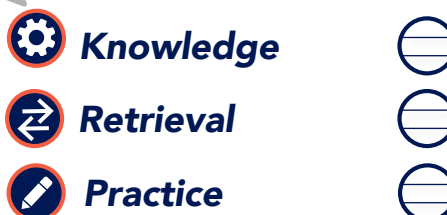


Practice



### B8 Respiration

84



Knowledge



Retrieval



Practice



### B4 Circulatory system

36



Knowledge



Retrieval



Practice



### B9 Adaptation, competition, and interdependence

96



Knowledge



Retrieval

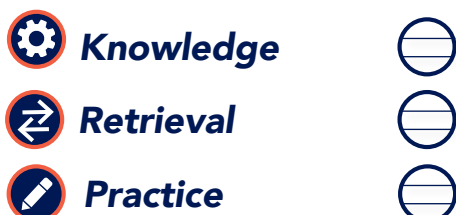


Practice



### B5 Organisation in plants

48



Knowledge



Retrieval

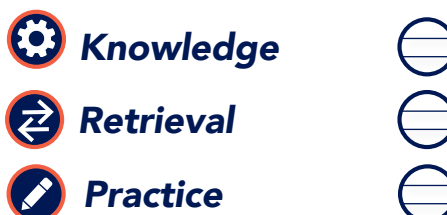


Practice



### B10 Organising an ecosystem

108



Knowledge

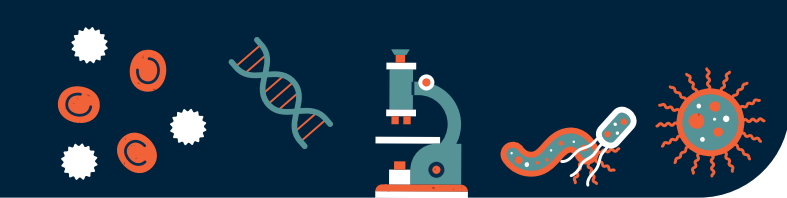


Retrieval






Practice











## B11 Humans and the environment 120

-  **Knowledge** ☐
-  **Retrieval** ☐
-  **Practice** ☐

## B12 Nervous system and homeostasis 130

-  **Knowledge** ☐
-  **Retrieval** ☐
-  **Practice** ☐




## B13 Hormonal coordination 140

-  **Knowledge** ☐
-  **Retrieval** ☐
-  **Practice** ☐

## B14 Behaviour 150

-  **Knowledge** ☐
-  **Retrieval** ☐
-  **Practice** ☐

## B15 Preventing and treating disease 158

-  **Knowledge** ☐
-  **Retrieval** ☐
-  **Practice** ☐




## B16 Reproduction and cell division 170

-  **Knowledge** ☐
-  **Retrieval** ☐
-  **Practice** ☐




## B17 Variation and inheritance 180

-  **Knowledge** ☐
-  **Retrieval** ☐
-  **Practice** ☐

## B18 Genetic manipulation 192

-  **Knowledge** ☐
-  **Retrieval** ☐
-  **Practice** ☐

## B19 Evolution 202

-  **Knowledge** ☐
-  **Retrieval** ☐
-  **Practice** ☐

### Answers

All of the **answers** are on the website at [www.oxfordsecondary.com/oxfordaqa-revision](http://www.oxfordsecondary.com/oxfordaqa-revision)



# How to use this book



This book uses a three-step approach to revision: **Knowledge**, **Retrieval**, and **Practice**. It is important that you do all three; they work together to make your revision effective.

## 1 Knowledge

**Knowledge** comes first. Each chapter starts with a **Knowledge Organiser**. These are clear, easy-to-understand, concise summaries of the content that you need to know for your exam. The information is organised to show how one idea flows into the next so you can learn how all the science is tied together, rather than lots of disconnected facts.

### Revision Tip

**Revision tips by Primrose Kitten** give you quick ways to understand the core concepts and practise remembering them.

#### Revision Tip

This is one area where biology and chemistry overlap. The first part of the graph can be explained by the collision theory you have learnt in your chemistry lessons.

#### Key Terms

Make sure you can write a definition for these key terms.

active site amylase catalyse denatured enzyme  
lipase optimum protease substrate

B6 Enzymes and digestion

**Knowledge**

**B6 Enzymes and digestion**

**Enzymes**

Enzymes are large proteins that **catalyse** (speed up) reactions. Enzymes are not changed in the reactions they catalyse.

**Lock and key theory**

This is a simple model of how enzymes work:

1. The enzyme's **active site** (where the reaction occurs) is a specific shape.
2. The enzyme (the lock) will only catalyse a specific reaction because the **substrate** (the key) fits into its active site.
3. At the active site, enzymes can break molecules down into smaller ones or bind small molecules together to form larger ones.
4. When the products have been released, the enzyme's active site can accept another substrate molecule.

**Digestive enzymes**

Digestive enzymes are produced in glands and the lining of the gut. They are released into the gut, where they come into contact with food molecules. Digestive enzymes catalyse the breakdown of large, insoluble food molecules into small, soluble molecules that can then be absorbed into the bloodstream. For example, carbohydrases break down carbohydrates into simple sugars. These products of digestion can be used to build new carbohydrates, lipids, and proteins. Some of the glucose produced is used in respiration.

Enzyme	Site of production	Reaction catalysed	Site of reaction
amylase	salivary glands, pancreas, small intestine	starch → glucose	mouth and small intestine
proteases	stomach, pancreas, small intestine	proteins → amino acids	stomach and small intestine
lipases	pancreas, small intestine	lipids → fatty acids and glycerol	small intestine

**The effect of pH on enzymes**

Different enzymes have different **optimum pH** values. This allows enzymes to be adapted to work with their environments with different pH values. For example, the stomach produces hydrochloric acid. Enzymes in the stomach work most effectively in acid conditions.

**Bile**

Bile is produced in the liver and stored in the gall bladder. From there, it is released into the small intestine. Bile has two main roles in digestion:

- It creates alkaline conditions – to allow small intestine enzymes to work effectively.
- It emulsifies fats – increasing the surface area of fats for lipase enzymes to act on.

### Key Terms

The **Key terms** box gives you the important words and language that you need to understand and be able to use confidently.

## 2 Retrieval

The **Retrieval questions** help you learn and quickly recall the information you've acquired. These are short questions and answers about the content in the Knowledge Organiser. Cover up the answers with some paper; write down as many answers as you can from memory. Check back to the Knowledge Organiser for any you got wrong, then cover the answers and attempt *all* the questions again until you can answer all the questions correctly.

**Retrieval**

Now use the questions below to check your knowledge from previous chapters.

**B6**

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

B6 questions	Answers
1. What are enzymes?	protein molecules that catalyse specific reactions in organisms
2. Why are enzymes described as specific?	each enzyme only catalyses a specific reaction, because the active site only fits together with certain substrates (like a lock and key)
3. Describe the function of amylase.	to break down starch into glucose
4. Where is amylase produced?	salivary glands, pancreas, and small intestine
5. Describe the function of proteases.	to break down proteins into amino acids
6. Where are proteases produced?	stomach, pancreas, and small intestine
7. Describe the function of lipases.	to break down lipids into fatty acids and glycerol
8. Where are lipases produced?	pancreas and small intestine
9. What are two factors that affect the rate of activity of an enzyme?	temperature and pH
10. What does denatured mean?	shape of an enzyme's active site is changed by high temperatures or an extreme pH, so it can no longer bind with the substrate
11. Describe the effect of temperature on enzyme activity.	as temperature increases, rate of reaction increases until it reaches the optimum for enzyme activity – above this temperature enzyme activity decreases and eventually stops
12. Describe the effect of pH on enzyme activity.	different enzymes have a different optimum pH at which their activity is greatest – at a pH much lower or higher than this, enzyme activity decreases and eventually stops
13. Why do different digestive enzymes have different optimum pHs?	different parts of the digestive system have very different pHs – the stomach is strongly acidic and the pH in the small intestine is close to neutral
14. Describe the role of bile in digestion.	creates alkaline conditions needed for small intestine enzymes and emulsifies fats
15. Give three commercial uses of enzymes.	biological detergents, baby foods, lower-calorie food production

**Previous questions**

1. What is the function of saliva in digestion?
2. Why is active transport needed in plant roots?
3. What is the function of the guard cells?
4. Define the term transpiration.
5. How does the structure of an artery relate to its function?
6. What is the function of a nerve cell?
7. Name four factors that affect transpiration.
8. Name the five levels of organisation.

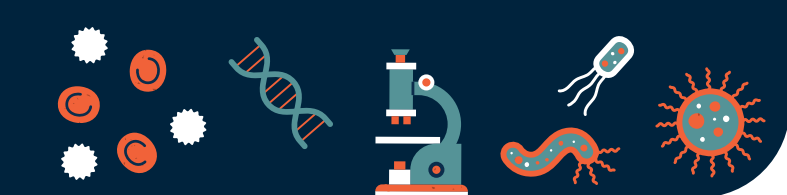
**Required Practical Skills**

Practise answering questions on the required practicals using the example below. You need to be able to apply your skills and knowledge to other practicals too.

Rate of enzyme reaction	Worked example	Practice
This practical tests your ability to accurately measure and record time, temperature, volume, and pH. You will need to know how to find the rate of a reaction by using a continuous sampling technique to measure the time taken for an indicator to change colour. You will be familiar with measuring the effect of pH on the rate of reaction of amylase digesting starch, using iodine as an indicator. This method can also be used to investigate the effect of temperature by placing the enzyme and substrate solutions in different temperature water baths.	A class carried out an investigation into the effect that pH has on the ability of amylase to break down carbohydrates. They timed how long it took for the amylase to break down starch at different pH values between 5 and 11. Suggest the results the class would observe. <b>Answer:</b> The optimum pH for amylase is 7, so the starch will be broken down fastest at pH 7. The starch will be broken down fastest at pH 7. The starch will be broken down fastest at pH 7.	1. A student wanted to repeat the experiment on the following day to compare their results. Suggest why using the same enzyme solution on two different days would not give comparable results.

Each chapter also has some **Retrieval questions** from **previous chapters**. Answer these to see if you can remember the content from the earlier chapters. If you get the answers wrong, go back and do the Retrieval questions for the earlier chapters again.

The **Skills** boxes cover either a **Practical**, **Working Scientifically**, or a key **Maths Skill**. Read through the worked example then have a go at the practice questions.






Make sure you revisit the retrieval questions on different days to help them stick in your memory. You need to write down the answers each time, or say them out loud, otherwise it won't work.

### 3 Practice


Once you think you know the Knowledge Organiser and Retrieval answers really well you can move on to the final stage: **Practice**.


Each chapter has lots of **exam-style questions**, including some questions from previous chapters, to help you apply all the knowledge you have learnt and can retrieve.


Each question has a difficulty icon that shows the level of challenge.

-  These questions build your confidence.
-  These questions consolidate your knowledge.
-  These questions stretch your understanding.

Make sure you attempt all of the questions no matter what grade you are aiming for.

 Questions with the conical flask icon test your **practical skills**.


 Questions with the calculator icon test your **mathematical skills**.

 **Exam Tip**

**Exam tips** written by **Primrose Kitten** show you how to interpret the questions, what you need to do in your answers, and advice on how to secure as many marks as possible.

**Practice** B6

**Exam-style questions**

01 Lipase is an enzyme that breaks down lipids.  **Exam Tip**

01.1 Name the products when a lipid is broken down. [1 mark]

01.2 Name **one** organ in the body where lipase is made. [1 mark]

01.3 A group of students investigated the effect of temperature on the rate of lipase action.

20 °C and 50 °C.

Name the independent variable in the students' investigation. [1 mark]

01.4 Suggest why the lipase solution and lipid solution were left in the water bath for five minutes before mixing. [1 mark]

01.5 The students' results are shown in **Table 1**.

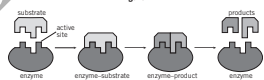
Temperature in °C	Mean time taken until no lipid remained in min
20	25
25	15
30	10
35	5
40	3
45	2

Describe the effect on the breakdown of the lipid when the temperature is increased between 20 °C and 35 °C. [1 mark]

01.6 Explain the result that was observed at 50 °C. [2 marks]

02 **Figure 1** demonstrates the lock and key theory of enzyme action.

**Figure 1**



02.1 Using **Figure 1** and your own knowledge, explain what is meant by enzyme specificity. [3 marks]

02.2 Explain why you only need a small volume of an enzyme to catalyse a reaction. [2 marks]

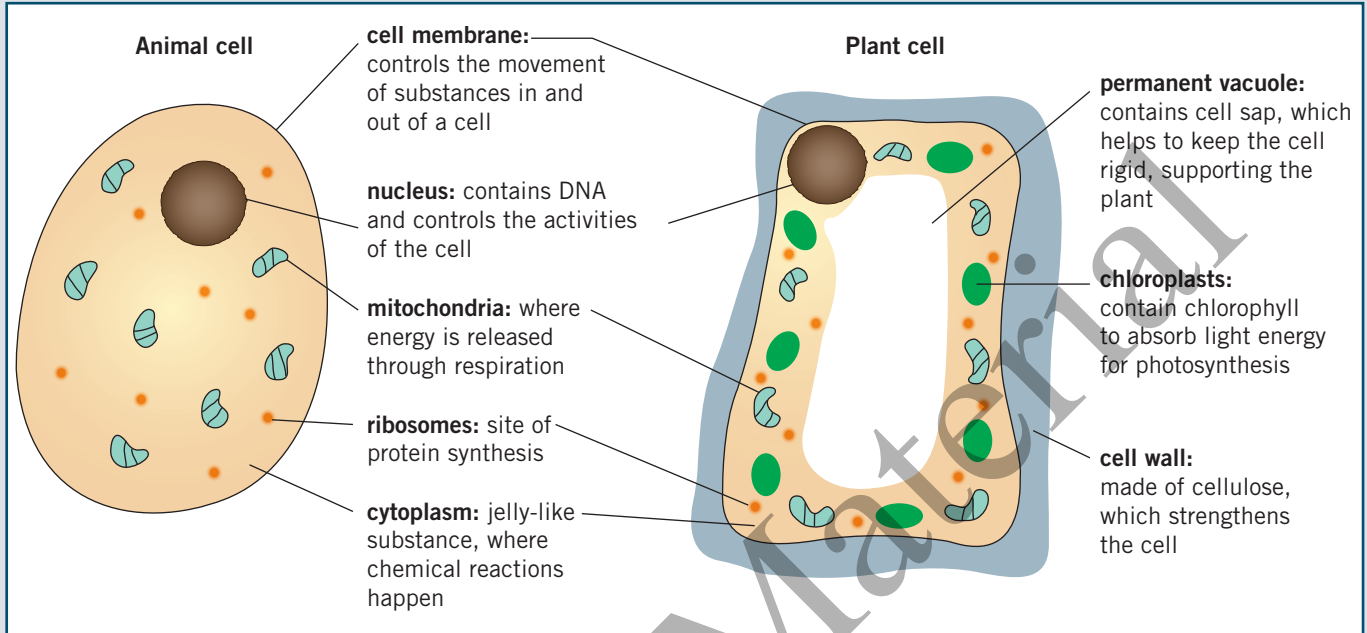
02.3 Describe **one** example of an enzyme-controlled reaction where small molecules are joined together to form a larger molecule. [1 mark]



## B1 Cell biology

### Eukaryotic cells

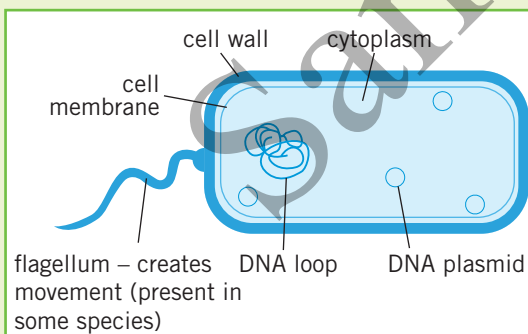
Animal and plant cells are **eukaryotic** cells. They have genetic material (**DNA**) that forms **chromosomes** and is contained in a **nucleus**.



### Prokaryotic cells

Bacteria are single-celled organisms. They are made of a prokaryotic cell. **Prokaryotic** cells:

- have no nucleus – they have a single loop of DNA
- have small rings of DNA called **plasmids**
- are smaller than eukaryotic cells.





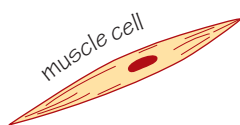
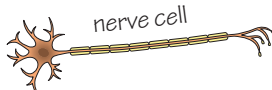
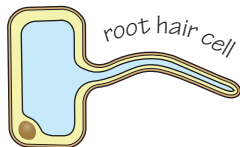
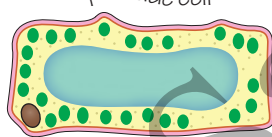
### Comparing sub-cellular structures

Structure	Animal cell	Plant cell	Prokaryotic cell
cell membrane	✓	✓	✓
cytoplasm	✓	✓	✓
nucleus	✓	✓	—
cell wall	—	✓	✓
chloroplasts	—	✓	—
permanent vacuole	—	✓	—
DNA free in cytoplasm	—	—	✓
plasmids	—	—	✓



## Specialised cells

Cells in animals and plants differentiate to form different types of cells. Most animal cells differentiate at an early stage of development, whereas a plant's cells differentiate throughout its lifetime.

Specialised cell	Function	Adaptations
 sperm cell	fertilises an ovum (egg)	<ul style="list-style-type: none"> <li>tail to swim to the ovum and fertilise it</li> <li>lots of <b>mitochondria</b> to release energy from respiration, enabling the sperm to swim to the ovum</li> </ul>
 red blood cell	transports oxygen around the body	<ul style="list-style-type: none"> <li>no nucleus so more room to carry oxygen</li> <li>contains a red pigment called haemoglobin that binds to oxygen molecules</li> <li>flat bi-concave disc shape to increase surface area to volume ratio</li> </ul>
 muscle cell	contracts and relaxes to allow movement	<ul style="list-style-type: none"> <li>contains protein fibres, which can contract to make the cells shorter</li> <li>contains lots of mitochondria to release energy from respiration, allowing the muscles to contract</li> </ul>
 nerve cell	carries electrical impulses around the body	<ul style="list-style-type: none"> <li>branched endings, called dendrites, to make connections with other neurones or effectors</li> <li>myelin sheath insulates the axon to increase the transmission speed of the electrical impulses</li> </ul>
 root hair cell	absorbs mineral ions and water from the soil	<ul style="list-style-type: none"> <li>long projection speeds up the absorption of water and mineral ions by increasing the surface area of the cell</li> <li>lots of mitochondria to release energy for the active transport of mineral ions from the soil</li> </ul>
 palisade cell	enables photosynthesis in the leaf	<ul style="list-style-type: none"> <li>lots of chloroplasts containing chlorophyll to absorb light energy</li> <li>located at the top surface of the leaf where it can absorb the most light energy</li> </ul>



### Key Terms

Make sure you can write a definition for these key terms.

cell membrane

cell wall

chloroplast

chromosome

cytoplasm

DNA

eukaryotic

mitochondria

nucleus

permanent vacuole

plasmid

prokaryotic

ribosome



# Retrieval



Learn the answers to the questions below, then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

## B1 questions

## Answers

1	What are two types of eukaryotic cell?	animal and plant
2	What type of cell are bacteria?	prokaryotic
3	Where is DNA found in animal and plant cells?	in the nucleus
4	What is the function of the cell membrane?	controls movement of substances in and out of the cell
5	What is the function of mitochondria?	site of respiration to transfer energy for the cell
6	What is the function of chloroplasts?	contain chlorophyll to absorb light energy for photosynthesis
7	What is the function of ribosomes?	enable production of proteins (protein synthesis)
8	What is the function of the cell wall?	strengthens and supports the cell
9	What is the structure of the main genetic material in a prokaryotic cell?	single loop of DNA
10	What are plasmids?	small rings of DNA containing extra genes (in addition to the DNA in chromosomes)
11	What is the function of a red blood cell?	carries oxygen around the body
12	Give three adaptations of a red blood cell.	no nucleus, contains a red pigment called haemoglobin, and has a bi-concave disc shape
13	What is the function of a nerve cell?	carries electrical impulses around the body
14	Give two adaptations of a nerve cell.	branched endings, myelin sheath insulates the axon
15	What is the function of a sperm cell?	fertilises an ovum (egg)
16	Give two adaptations of a sperm cell.	tail, contains lots of mitochondria
17	What is the function of a palisade cell?	carries out photosynthesis in a leaf
18	Give two adaptations of a palisade cell.	lots of chloroplasts, located at the top surface of the leaf
19	What is the function of a root hair cell?	absorbs minerals and water from the soil
20	Give two adaptations of a root hair cell.	long projection, lots of mitochondria