Contents

Introduction

Practice Makes Permanent is a series that advocates the benefits of answering lots and lots of questions. The more you practise, the more likely you are to remember key concepts; practice does make permanent. The aim is to provide you with a strong base of knowledge that you can automatically recall and apply when approaching more difficult ideas and contexts.

This book is designed to be a versatile resource that can be used in class, as homework, or as a revision tool. The questions may be used in assessments, as extra practice, or as part of a SLOP (i.e. Shed Loads of Practice) teaching approach.

How to use this book

This book is suitable for the AQA GCSE Biology course, both at Higher and Foundation levels. It covers all the content that you will be expected to know for the final examination.

The content is arranged topic-by-topic in the order of the AQA specification, so areas can be practised as needed. Within each topic there are:

- **Quick questions** – short questions designed to introduce the topic.
- **Exam-style questions** – questions that replicate the types, wording and structure of real exam questions, but highly-targeted to each specification point.
- **Topic reviews** – sections of exam-style questions that test content from across the entirety of each topic more synoptically.

These topic questions are tagged with the following:

p64	page references for the accompanying Hodder Education Student Book: AQA GCSE (9-1) Biology, 9781471851339. This can be revisited before or after attempting the questions in a topic.
4.1.1.1	the AQA specification reference, which can be used if you want to practise specific areas.
H	indicates Higher-only content.
MS5b	indicates where questions test Maths skills.
QWC	indicates where answers will also be marked on the quality of written communication.
WS	indicates where questions require you to work scientifically.
AT	indicates where questions ask you to use practical knowledge of apparatus and techniques.
RP	indicates where questions test understanding of required practicals.

At the end of the book there is a full set of **practice exam papers**. These have been carefully assembled to resemble typical AQA question papers in terms of coverage, marks and skills tested. We have also constructed each one to represent the typical range of demand in the GCSE Biology specification as closely as possible.

Full worked **answers** are included at the end of the book for quick reference, with awarded marks indicated where appropriate.

1 Cell biology

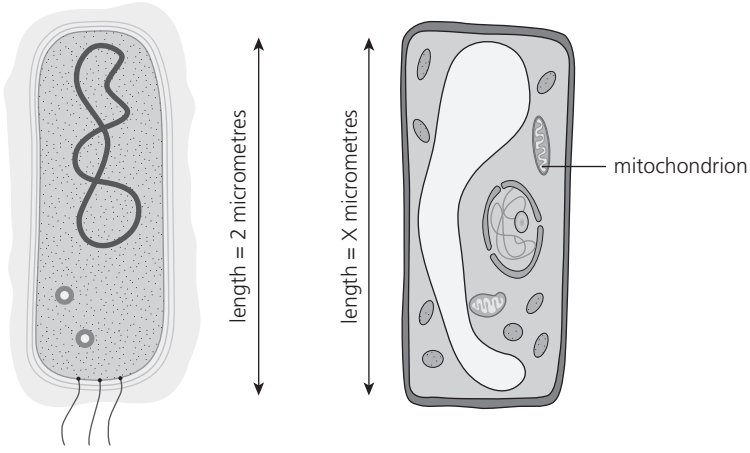
Cell structure

Quick questions

p2	4.1.1.1	1	What is a 'eukaryotic cell'?
p3	4.1.1.1	2	What is a 'prokaryotic cell'?
p5	4.1.1.1	3	Are plant cells eukaryotic or prokaryotic?
p3	4.1.1.1	4	Are bacterial cells eukaryotic or prokaryotic?
p6	4.1.1.2	5	Plant and algal cells have cell walls. What is their cell wall made of?
p10	4.1.1.4	6	Cells **differentiate** as an organism develops. What does differentiate mean?
p12	4.1.1.5	7	What is meant by the 'resolution' (or 'resolving power') of a microscope?
p12	4.1.1.5	8	Why can ribosomes not be seen using a light microscope?
p12	4.1.1.5	9	Microscopes were first invented in 1590. Give the reason why mitochondria were not seen until 1840 and ribosomes were not seen until 1953.
p15	4.1.1.5	10	Give the formula for calculating the magnification of an object.
p11	4.1.1.5	11	Rearrange the equation for magnification to find: • the real size of an object • the image size.
p11	4.1.1.5 WS4.4, 4.5 MS1b	12	How many of the following are there in 1 metre? • millimetres (mm) • micrometres (μm) • nanometres (nm). Give your answers in standard form.
p91	4.1.1.6 RP2 MS5c	13	Give the equation used to calculate the area of a circle.
	4.1.1.6 MS1b	H 14	Convert these numbers into standard form: • 456 000 • 0.00032

Exam-style questions

15 **Figure 1** shows two cells labelled A and B. One is a prokaryotic cell and one is a eukaryotic cell.



Cell A, magnification ×40 000 Cell B, magnification ×400

Figure 1

p3 4.1.1.1

15–1 Give the letter of the prokaryotic cell. *[1]*

p3–5 4.1.1.1

15–2 Describe **two** ways that cell **A** is different from cell **B**. *[2]*

p16 4.1.1.1 WS4.5 MS2h

15–3 Cell **A** is 2 micrometres (µm) long. Give its length in millimetres (mm) and in nanometres (nm). *[2]*

p15 4.1.1.5 MS2h, 3b WS4.5

15–4 **Figure 1** shows cell **A** and cell **B** the same length, but the magnification of each cell is different.

Cell **A** is 2 µm long. Cell **B** is X µm long.

Calculate the length of cell **B**. *[2]*

p4–5 4.1.1.2

15–5 Mitochondrion, ribosome and nucleus are structures found in eukaryotic cells.

Write the structures in order of size from smallest to largest. *[1]*

p3–5 4.1.1.1

15–6 Suggest **one** reason why prokaryotic cells do not have mitochondria.

Use information from **Figure 1**. *[1]*

Total: 9

16 Cells are the basic unit of all living things.

Cells are either eukaryotic or prokaryotic.

Eukaryotic and prokaryotic cells have different structures.

p3–6 4.1.1.1

16–1 Copy and complete **Table 1** to show the structures present in each type of cell. *[3]*

Put a tick or a cross in each box.

	Prokaryotic cells only	Eukaryotic cells only	Prokaryotic and eukaryotic cells
Cell membrane			
Cell wall			
Cytoplasm			
Nucleus			
Plasmid			

Table 1

p3–6 4.1.1.1

16–2 Eukaryotic cells and prokaryotic cells both contain genetic material.

Describe **two** ways that the genetic material is arranged differently in prokaryotic and eukaryotic cells. *[2]*

p3–6 4.1.1.2

16–3 Cells contain sub-cellular structures.

Match the names of the sub-cellular structures, 1–5, with their function, A–E. *[5]*

Name of sub-cellular structure
1 Chloroplasts
2 Mitochondria
3 Cell wall
4 Permanent vacuole
5 Ribosome

Function
A Site of aerobic respiration
B Gives structure and support to the cell
C Site of protein synthesis
D Site of photosynthesis
E Supports the cell, filled with cell sap

p5–6 4.1.1.2

16–4 Plant cells contain chloroplasts, but animal cells do not.

Give **two** other differences between plant cells and animal cells. *[2]*

p12 4.1.1.5

16–5 Some of the sub-cellular structures in cells can only be seen using an electron microscope.

Give **two** reasons why electron microscopes are used to study cells in finer detail than light microscopes. *[2]*

p10 4.1.1.4

16–6 Cells may differentiate to become specialised cells.

Explain what happens when a cell differentiates. *[2]*

p10 4.1.1.4

16–7 Describe the main difference between differentiation in animal cells and plant cells. *[2]*

p8–10 &69 4.1.1.3 QWC

16–8 Describe at least **three** of the structures and functions of specialised plant and animals cells. *[6]*

Total: 24

p4–7&11 4.1.1.2

17 **Figure 2** shows a light microscope.

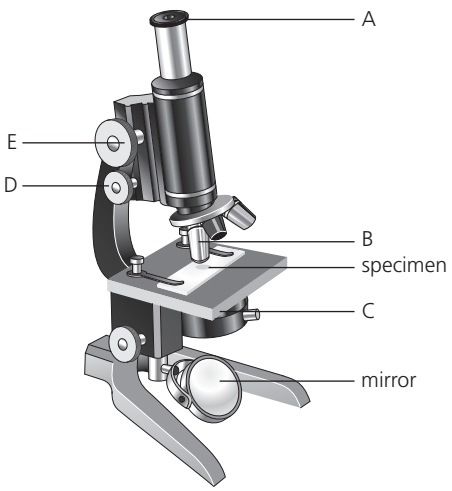


Figure 2

17–1 Name the parts of the microscope labelled A–E. Choose your answers from the options below. *[5]*

eyepiece lens	objective lenses	coarse focus	fine focus	stage

RP1
AT7

17–2 Describe a method used to prepare cheek cells for viewing with a light microscope. *[3]*

QWC
RP1
AT7

17–3 Describe how a light microscope can be used to view a prepared slide of cells at **high** power. *[6]*

WS1.2, 3.1
AT7

17–4 **Figure 3** shows a cheek cell seen with a light microscope.

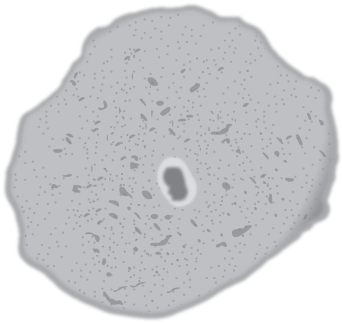


Figure 3

Draw the cell shown in the photo. Label the cell membrane, cytoplasm and nucleus. *[2]*

17–5 Describe the functions of these three parts of a cell: cell membrane, cytoplasm and nucleus. *[3]*

17–6 The cell in **Figure 3** is an animal cell.

Give **two** reasons why the cell can be identified as an animal cell and not a plant cell. *[2]*

RP1
AT7

17–7 A student uses a light microscope to look at cheek cells. The image is not clear.

Suggest what the student needs to do to the microscope to produce a clear image. *[1]*

RP1
AT7

17–8 Another student looks at cheek cells using the light microscope, but cannot see individual cells.

Suggest what the student needs to do to the microscope to see individual cells. *[2]*

Total: 24

p80–2 4.1.1.6

18 Bacteria can divide very rapidly.

18–1 Name the process of simple cell division in bacteria. *[1]*

18–2 Give **two** conditions needed for rapid cell division. *[2]*

18–3 Bacteria can be grown in a culture medium. Name **one** example of a culture medium. *[1]*

WS2.2, 2.4
RP2
AT4
QWC

18–4 A student is given a pure culture of bacteria in liquid nutrient broth.

Describe how the student can prepare an uncontaminated culture of bacteria on solid agar jelly using aseptic technique. Explain why each of the steps is necessary. *[6]*

WS3.3, 4.6
MS1b, d,2a

18–5 The student uses the uncontaminated culture to investigate the effect of antibiotics.

The student grows the bacteria on an agar plate with paper discs containing antibiotics, then measures the diameters of the zones of inhibition around each paper disc.

The bacteria the student uses has a mean division time of 40 minutes. Starting with a single bacterial cell, calculate the number of bacteria in a population after 24 hours.

Give your answer in standard form. *[3]*

MS1c

18–6 **Table 2** shows the diameters of the zones of inhibition for four antibiotics tested by the student.

Antibiotic	Diameter of zone of inhibition in mm	Area of zone of inhibition in mm^2
A	12	
B	8	50
C	0	0
D	6	28

Table 2

Calculate the area of the zone of inhibition for antibiotic A. *[2]*

WS3.5

18–7 Which antibiotic is the most effective? Give **one** reason for your choice. *[2]*

Total: 17

Cell division

Quick questions

p19 4.1.2.1

1 Name the part of the cell that contains chromosomes.

p19 4.1.2.1

2 What are chromosomes made of?

p19 4.1.2.1

3 What are carried on chromosomes?

p19 4.1.2.1

4 How many of each chromosome is found in a human body cell?

Exam-style questions

p19–23 4.1.2.1

5 New cells are produced by cell division.

Figure 4 shows an animal cell with some of its structures magnified to show more detail.

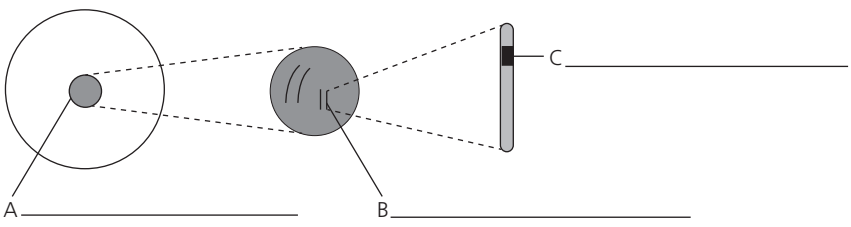


Figure 4

5–1 Name parts A–C. Choose your answers from the options below. *[3]*

chromosome	gene	nucleus

5–2 Multicellular organisms, such as plants, use cell division during their development.

Give **one** other use of cell division by mitosis in multicellular organisms. *[1]*

5–3 Plants contain meristem tissue. What is the function of meristem tissue? *[1]*

5–4 Stem cells from meristem tissue in plants can be used to produce clones.

Give **two** advantages of producing clones using stem cells from meristem tissue. *[2]*

5–5 Plant cloning can be used to protect rare species from extinction. Describe one other use of plant cloning. *[2]*

Total: 9

p20–1 4.1.2.2

6 Cells divide in a series of stages called the cell cycle.

Before a cell can divide, changes need to happen in the cell. One of the changes is to the genetic material.

Figure 5 shows a chromosome before and after one of the stages of the cell cycle.

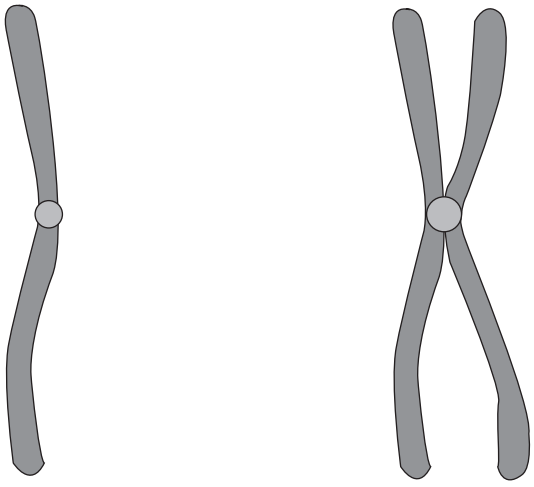


Figure 5

6–1 What process has caused the change in the appearance of the chromosome? *[1]*

6–2 Give **one** other change that happens in a cell before it divides that is not related to its genetic material. *[1]*

6–3 A cell from an onion has eight chromosomes. The cell divides by mitosis.

Give the number of chromosomes in one of the new cells. *[1]*

6–4 **Figure 6** shows some onion cells at different stages of the cell cycle.

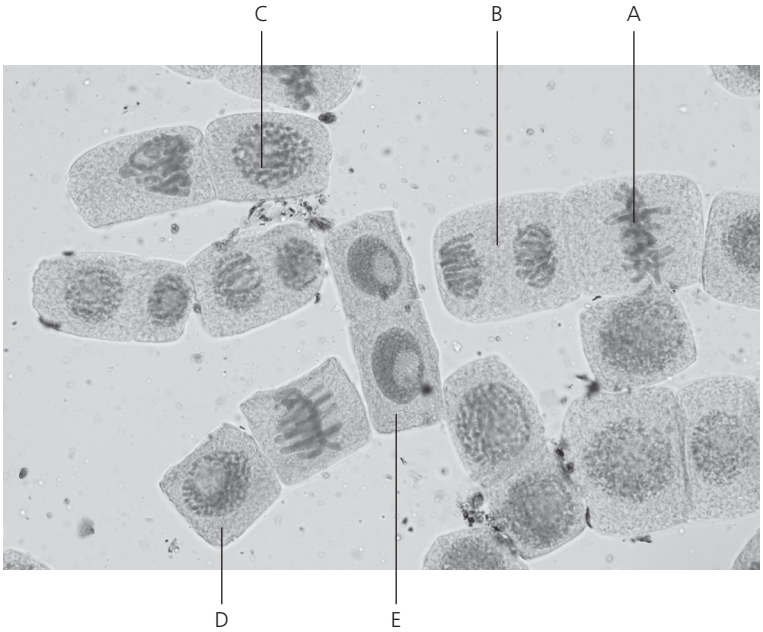


Figure 6

Give the letter of the cell that is **not** dividing by mitosis. *[1]*

6–5 What is happening to the chromosomes in cell B? *[1]*

6–6 Describe what is happening in cell E. *[2]*

Total: 7

p22–4 4.1.2.3

7 Stem cells have an important function in living organisms.

7–1 What is a 'stem cell'? *[2]*

7–2 Human stem cells can be found in human embryos and in adult bone marrow.

Describe the main difference between stem cells from embryos and stem cells from adult bone marrow. *[2]*

7–3 Therapeutic cloning produces an embryo with the same genes as the patient.

Give **one** advantage of treatment with cells that have the same genes as the patient. *[1]*

7–4 Name **two** conditions that could be treated with stem cells. *[2]*

WS3 **7–5** Describe **two** reasons why people may be against the use of stem cells. *[2]*

7–6 Leukaemia is a disease that affects the blood. A patient with leukaemia can be treated using stem cells. The stem cells can be obtained from the patient's own bone marrow. Stem cells can also be obtained from human embryos.

WS1.3 QWC Evaluate the use of stem cells from the patient and from human embryos. *[6]*

Total: 15

Practice exam papers

Paper 1

1 **Figure 1** shows a human cheek cell as seen using a light microscope.

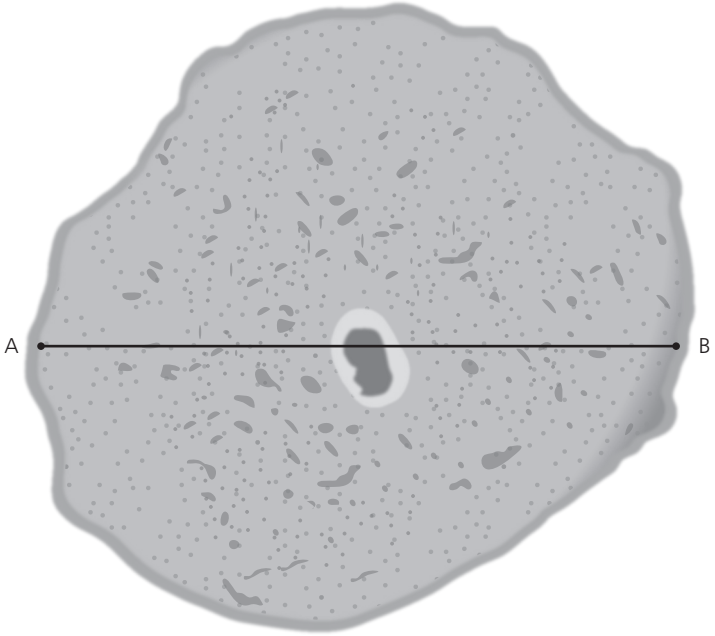


Figure 1

1–1 Draw a scientific drawing of the cheek cell.

Label the nucleus and cell membrane on your drawing. *[2 marks]*

1–2 The real diameter of the cheek cell in **Figure 1** is 60 µm between points **A** and **B**.

Calculate the magnification of the cheek cell. *[3 marks]*

1–3 Name **one** structure found in a root hair cell that is not found in a cheek cell. *[1 mark]*

The cheek cell contains ribosomes and a nucleus.

1–4 Give the function of ribosomes. *[1 mark]*

1–5 Name the group of living things that do not have their genetic material enclosed in a nucleus. *[1 mark]*

1–6 Give **two** reasons why ribosomes can be seen using an electron microscope, but not using a light microscope. *[2 marks]*

Total: 10

2 Measles is an infectious disease that can be fatal.

2–1 Name the type of pathogen that causes measles. *[1 mark]*

2–2 Young children are given the MMR vaccine to protect them against measles, mumps and rubella.

Explain how vaccination can prevent illnesses such as measles. *[6 marks]*

Read this information:

In 1998, Andrew Wakefield claimed there was a link between the MMR vaccine and autism.

Autism affects brain function and can cause difficulties with communication and behaviour.

Wakefield based his claim on the cases of 12 children. The parents of eight of the children said their child started showing signs of behaviour change after receiving the MMR vaccination.

Wakefield's work has been completely discredited.

In a recent study, researchers followed 657 461 Danish children until they were on average eight years old. 95% of children in the study were vaccinated against MMR.

Around 1 in 100 of the children in the Danish study developed autism, but there was no difference in the rates of autism between those who had been vaccinated and those who had not.

2–3 Suggest **two** reason why Wakefield's claim that the MMR vaccine causes autism is not valid. *[2 marks]*

2–4 Calculate the approximate number of children in the Danish study who developed autism. *[1 mark]*

2–5 The World Health Organisation recommends that at least 95% of children are vaccinated against MMR.

In 2018, the vaccination rate for MMR in England was 91.2%

Suggest **one** reason why parents may choose not to vaccinate their children. *[1 mark]*

Total: 11