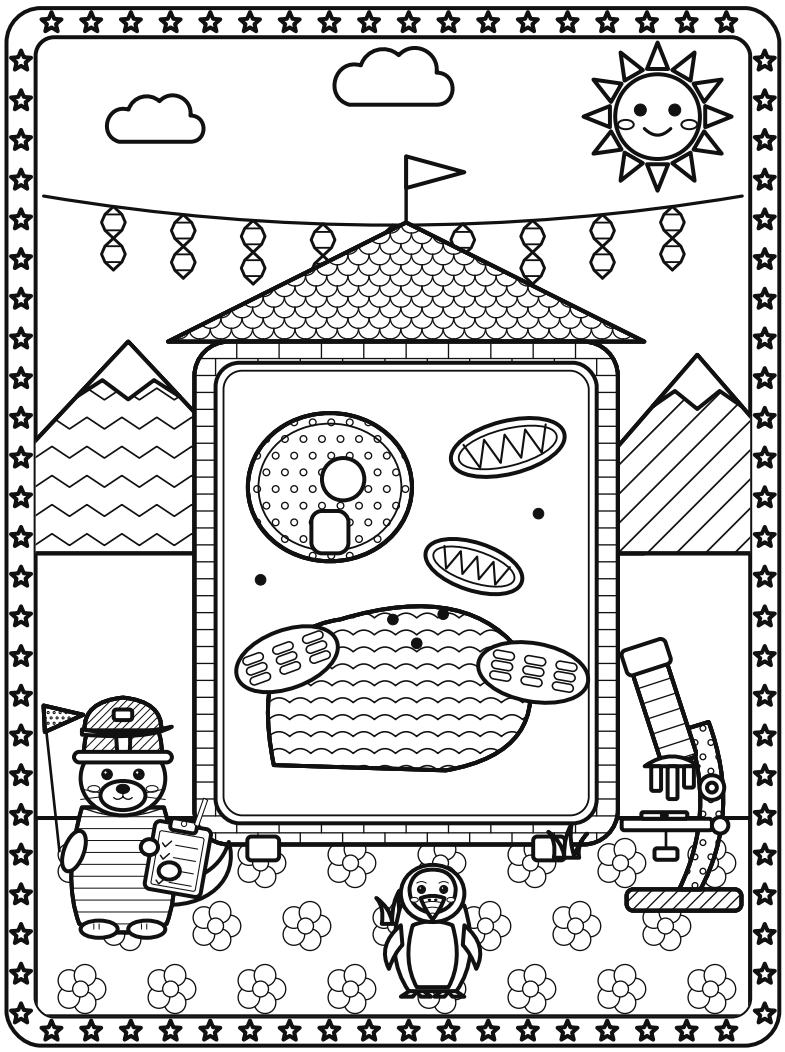
REAL-LIFE BIOLOGY

Cell Biology

Workbook for National 5 Biology

Unit: Cell Biology



C. Blewis

Blewis LEARNING

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How to use this book

This book covers Cell Biology for National 5 Biology: cell structure, transport across membranes, DNA and protein production, proteins and enzymes, genetic engineering and respiration. Each topic follows the same pattern, so you always know what comes next.

EACH TOPIC HAS

Opener	the story for the topic, what you will learn and the key words
Learn pages	short explanations with diagrams, and questions to try
Practical	You plan the investigation yourself, carry it out safely, take repeat readings, draw a graph and evaluate your method.
Brain break	a calm puzzle or colouring page
Check-up	a few questions to show what you know, and a checklist

PRACTICAL WORK: STAY SAFE

- Only start a practical when an adult says it is OK.
- Read the whole method and the Stay safe table first.
- Tell your teacher about anything that might affect you, like asthma or an allergy.
- Stop and tell an adult if you feel unwell or something goes wrong.

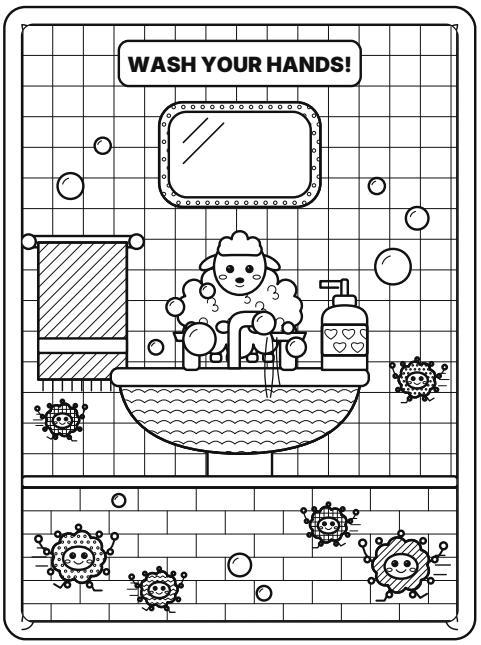
NO LAB TODAY?

Every practical has a set of example results. If you could not do the experiment, use these to finish the results, graph and conclusion.

DOODLE CORNERS

Some pages have a doodle corner. Colour it or doodle in it when you need a short break.

Cell structure



A slice of onion, a drop of pond water and a pinch of yeast all look like nothing much. Put them under a microscope and each one is packed with cells.

Theme: the Glen Arrin school microscope club. Mia runs a lunchtime microscope club. This term the club is building a photo wall of every kind of cell they can find, from onion skin to yeast and bacteria, with a label for every part.

IN THIS TOPIC YOU WILL LEARN TO

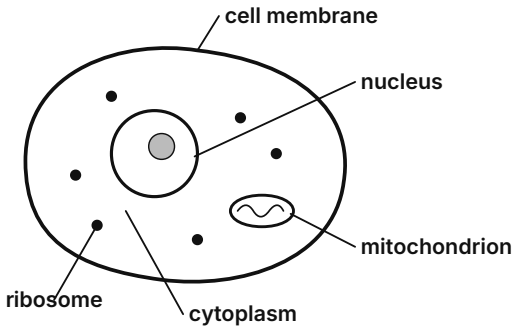
Skill 1	name the structures in animal, plant, fungal and bacterial cells and state what each one does
Skill 2	compare the four kinds of cell, including what their cell walls are made of
Skill 3	use a light microscope and calculate magnification and the real size of cells

KEY WORDS

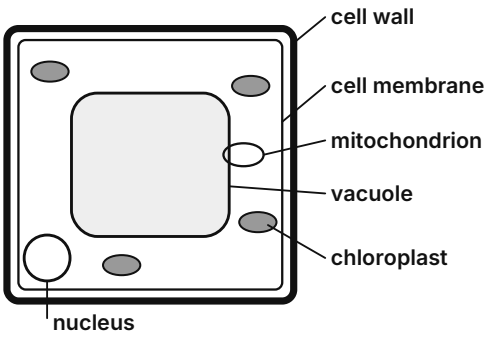
Ultrastructure	the fine detail of the structures inside a cell
Mitochondrion	where aerobic respiration releases energy
Ribosome	where proteins are made
Plasmid	a small ring of DNA found in bacteria
Cellulose	the substance plant cell walls are made of
Magnification	how many times bigger an image is than the real object

❶ Inside animal and plant cells

Every living thing is made of cells. Cells contain smaller structures, each with its own job. The fine detail of a cell is called its **ultrastructure**. Animal and plant cells both have a nucleus, cell membrane, cytoplasm, mitochondria and ribosomes. Plant cells also have a **cell wall**, a large **vacuole** and, in the green parts, **chloroplasts**.



Animal cell



Plant cell

1 Complete the table to give the job of each structure.

Structure	What it does
Nucleus	
Cell membrane	
Cytoplasm	
Mitochondrion	
Ribosome	
Cell wall	
Chloroplast	
Vacuole	

2 Name the **three** structures found in a leaf cell that are not found in a cheek cell.

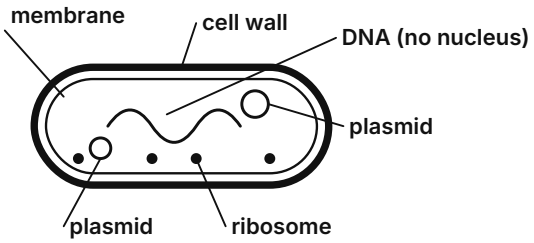
Answer:

3 Cells deep inside a carrot root have no chloroplasts. Explain why they do not need them.

Answer:

❷ Fungal and bacterial cells

Fungal cells, such as yeast, have a nucleus, mitochondria, ribosomes, a vacuole and a cell wall, but no chloroplasts. **Bacterial cells** are much smaller. They have a cell wall, membrane, cytoplasm and ribosomes but **no nucleus**: their DNA lies loose in the cytoplasm, and many also carry small rings of DNA called **plasmids**. Bacteria have no mitochondria or chloroplasts.



Bacterial cell

CELL WALLS ARE NOT ALL THE SAME

Plant cell walls are made of **cellulose**. Fungal and bacterial cell walls are made of **different materials**, not cellulose. A cell wall supports the cell and stops it bursting when it takes in water.

1 Put a tick (✓) or a cross (×) in each box.

Structure	Animal	Plant	Fungus (yeast)	Bacterium
Nucleus				
Cell wall				
Mitochondria				
Chloroplasts				
Plasmids				

2 A cell has a cell wall and a nucleus but no chloroplasts. Which **two** kinds of cell could it be?

Answer: .....

3 State **two** ways in which the DNA of a bacterial cell is different from the DNA of a plant cell.

Answer: .....

.....

PRACTICAL 1

Plan it: are the cells the same size in every layer of an onion?

AIM To find out whether the **LAYER OF THE ONION** affects the **MEAN LENGTH OF ITS EPIDERMIS CELLS.**

1 Variables

I will change the independent variable	
I will measure the dependent variable	
I will keep the same controlled variables (give two)	

2 Prediction

I think that .....

because .....

3 Equipment

Tick the equipment you need. Not everything here is useful.



☐ **Microscope**



☐ **Slides and cover slips**



☐ **Forceps**



☐ **Iodine and dropper**



☐ **Knife**



☐ **Thermometer**



☐ **Stopwatch**

4 Stay safe

The first row is done for you. Add two more hazards.

Hazard What could cause harm?	**Risk** What could happen?	**Control** How will I stay safe?
Iodine solution	It stains skin and can irritate eyes	Wear eye protection and wipe up spills straight away.

Method and results

5 Write your method

1. How will you take a thin piece of epidermis from each layer and make a slide?

2. Which magnification will you use, and how will you know the width of the field of view?

3. How will you count the cells across the field of view?

4. How many counts per layer? How will you work out the mean cell length?

6 Results

Complete the headings, including units.

				Mean number	Cell length

NO LAB TODAY? USE THESE RESULTS

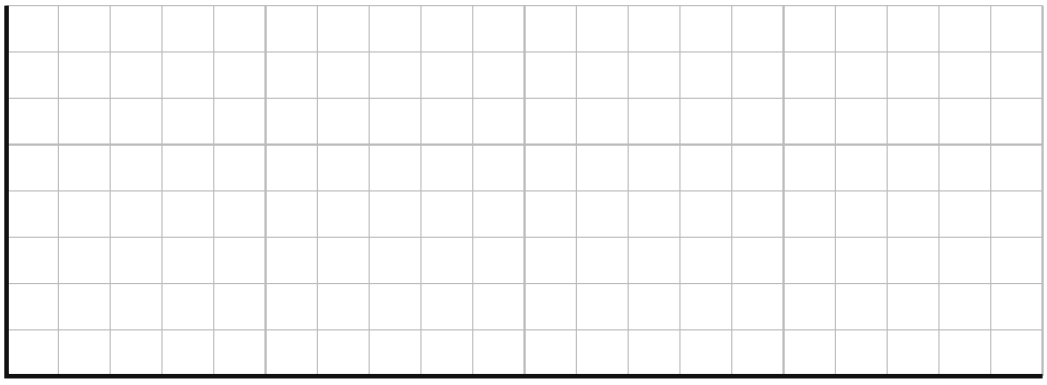
Layer	Count 1	Count 2	Count 3	Mean count	Mean cell length (µm)
1 (outer)	5	6	5		
2	6	6	7		
3	7	8	7		
4	9	8	9		
5 (inner)	10	11	10		

Field of view 1500 µm wide (× 100). Cells counted across the middle of the field in three different places. Work out the means and cell lengths yourself.

Analyse and evaluate

7 Draw a bar graph

Plot mean cell length against layer. Choose your own scale, label both axes with units and leave gaps between the bars.



8 Calculate

Show how you worked out the mean cell length for layer 3.

Answer:

9 Conclusion

As the layers go from outside to inside, the cells

10 Evaluate

a Why were the cells counted in three places on each slide?

Answer:

b Give one way to make the estimate more accurate.

Answer:

> **ASSIGNMENT LINK**
> For an assignment you could compare your cell lengths with values from a textbook or website. Record where the data came from so you can reference it.

FREE SAMPLE

Cell Biology (N5 Biology)

This sample shows a few pages. The full printed workbook is available from Amazon.

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