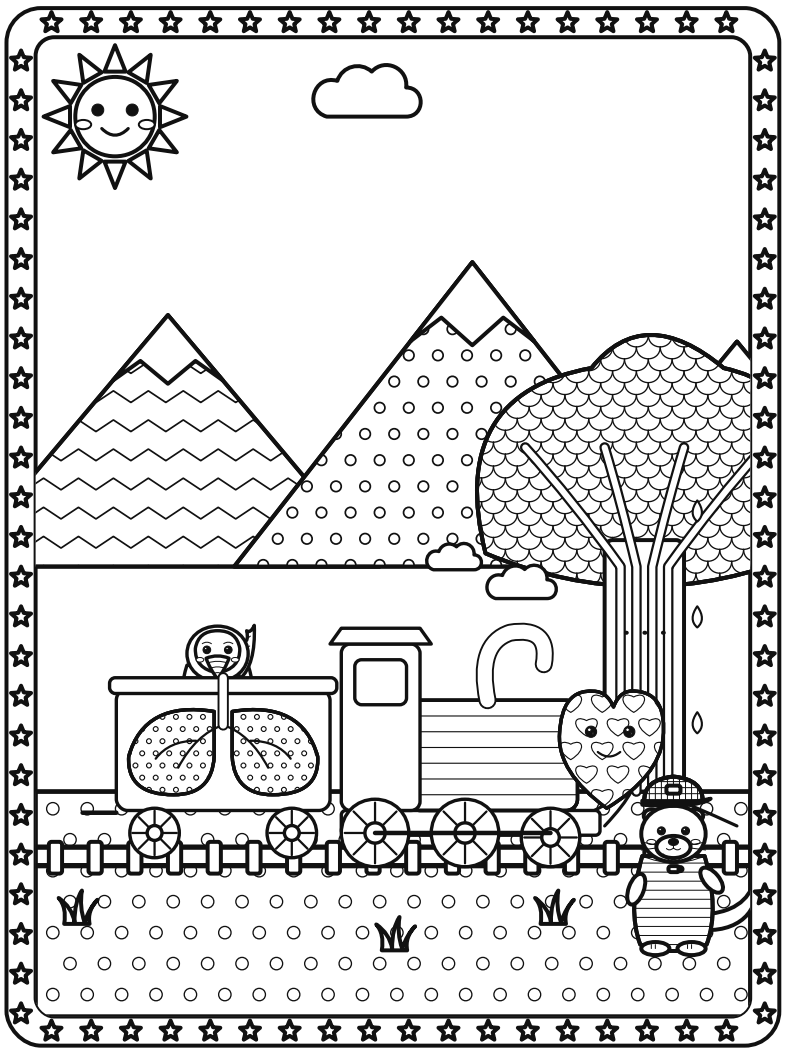
REAL-LIFE BIOLOGY

Multicellular Organisms

Workbook for National 5 Biology

Unit: Multicellular Organisms



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Blewis LEARNING

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How to use this book

This book covers Multicellular Organisms for National 5 Biology: producing new cells, control and communication, reproduction, variation and inheritance, transport in plants and animals, and absorption of materials. 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.

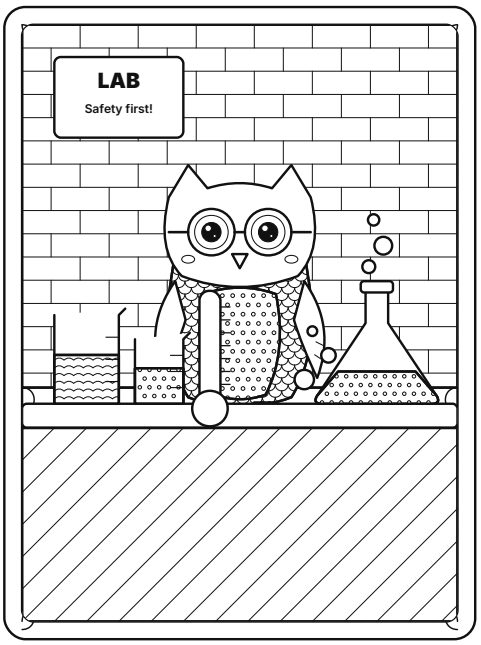
NO LAB TODAY?

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.

Producing new cells



You started life as one single cell. Now you are made of about 37 million million cells. Where did they all come from?

Theme: the Glen Arrin hospital lab. Ewan is on work experience in the research lab at Glen Arrin hospital. The scientists grow cells, study how they divide and look for ways stem cells could help repair the body.

IN THIS TOPIC YOU WILL LEARN TO

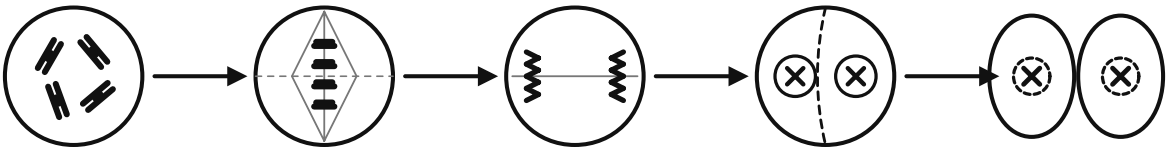
Skill 1	describe the stages of mitosis and explain why it keeps the chromosome number the same
Skill 2	explain the importance of mitosis for growth and repair, and what stem cells are and how they are used
Skill 3	describe how cells are organised into tissues, organs and systems

KEY WORDS

Mitosis	cell division that makes two cells identical to the parent cell
Chromosome	a thread of DNA carrying many genes
Chromatid	one of the two copies of a chromosome before division
Diploid	a cell with two sets of chromosomes
Stem cell	an unspecialised cell that can divide and become other cell types
Tissue	a group of similar cells working together

❶ The stages of mitosis

Before a cell divides, each chromosome makes an exact copy of itself. The two copies, called **chromatids**, stay joined. Then **mitosis** shares the chromatids out equally, so each new nucleus gets one copy of every chromosome.



1 Chromosomes as two chromatids | **2 Line up at** the equator | **3 Chromatids** pulled to poles | **4 Two nuclei** form | **5 Cytoplasm** divides

Spindle fibres attach to the chromosomes when they line up at the **equator** of the cell, then pull the chromatids apart to opposite **poles**. A nuclear membrane forms round each group, and finally the cytoplasm divides to give two cells.

1 Write the stages of mitosis in order, in your own words.

Stage	What happens
1	
2	
3	
4	
5	

2 What is the job of the spindle fibres?

Answer:

3 Explain why the two new cells have exactly the same genetic information as the parent cell.

Answer:

❷ Why mitosis matters

Human body cells are **diploid**: they have two sets of chromosomes, 46 in all. Mitosis keeps the **diploid chromosome number** the same in every new cell, so every body cell carries the full set of genetic information.

MITOSIS IS NEEDED FOR

- **growth**: making more cells as an organism gets bigger
- **repair**: replacing damaged or worn-out cells, for example healing a cut

DID YOU KNOW?

Cells lining your gut are replaced every few days, and new skin cells are made all the time. A cut finger heals because cells near the wound divide by mitosis.

1 A dog's body cells have 78 chromosomes. How many chromosomes will be in each cell made by mitosis? Explain your answer.

Answer:

2 State **two** reasons why a young tree needs mitosis.

Answer:

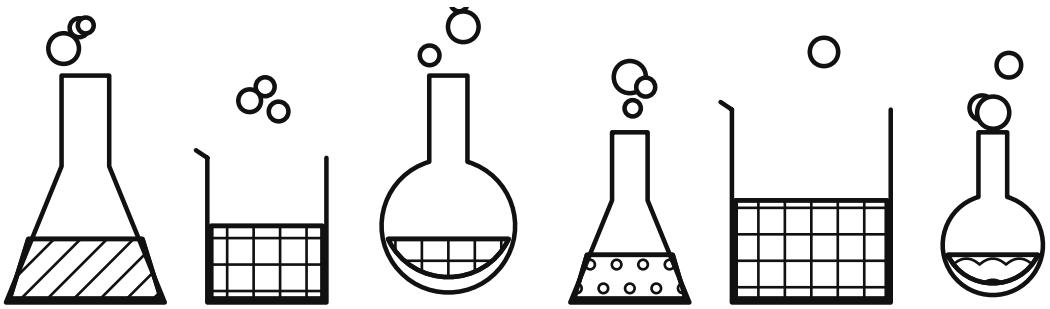
3 In a lab culture, one cell divides by mitosis every 20 minutes. How many cells will there be after 2 hours, if every cell keeps dividing?

Answer:

4 Isla says, "Mitosis halves the number of chromosomes." Explain why she is wrong.

Answer:

DOODLE CORNER



PRACTICAL 1

Plan it: how long does each stage of mitosis take?

AIM To count the cells at each stage of mitosis in a root tip. The more cells at a stage, the longer that stage lasts.

1 Variables

I will count the dependent variable	
I will compare the independent variable	
I will keep the same give two controlled variables	

2 Prediction

Most dividing cells will be at the stage ... because

3 Equipment

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



☐ **Light microscope**



☐ **Prepared root-tip slide**



☐ **Pencil and tally chart**



☐ **Thermo-meter**



☐ **Stopwatch**



☐ **Microscope lamp**

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?
Glass slides and cover slips	Cuts if they break	Carry slides flat and report breakages; do not pick up broken glass.

Method and results

5 Write your method

1. How will you focus on the root tip? Which objective lens will you use?

2. How will you decide which stage each cell is in?

3. How many fields of view will you count? Why more than one?

4. How will you work out the percentage of cells at each stage?

6 Results

Complete the headings.

Field of view					
1					
2					
3					
4					
5					

NO LAB TODAY? USE THESE RESULTS

Field	Not dividing	Chromosomes visible	Lined up at equator	Chromatids separating	Two nuclei forming
1	42	5	2	1	2
2	38	6	3	2	1
3	45	4	2	1	1
4	40	7	2	2	2
5	44	5	3	1	1
Total					

Cells counted in five fields of view of a prepared garlic root-tip slide at × 400.

Analyse and evaluate

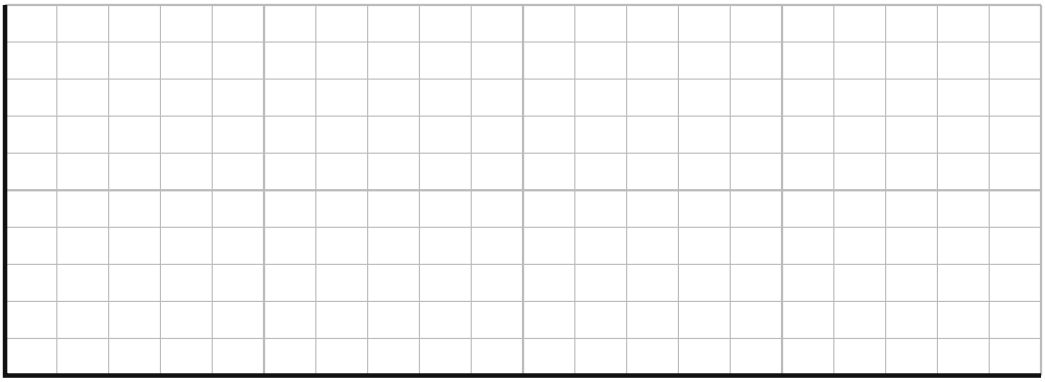
7 Process the results

a Add up each column in the sample results to complete the Total row.

b Calculate the percentage of all the cells counted that were dividing.

Answer:

c Draw a bar chart of the total number of **dividing** cells at each of the four stages.



8 Conclusion

Which stage lasts longest? How do you know?

9 Evaluate

a Why does counting five fields of view make the results more reliable?

Answer:

b Suggest one reason two pupils might put the same cell in different stages, and how to reduce this.

Answer:

ASSIGNMENT LINK

In a report, show raw counts in a table, then the percentages you calculated, and say how many fields you counted.

FREE SAMPLE

Multicellular Organisms (N5 Biology)

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

blewislearning.co.uk

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