A cell of rooms

60 minutes • B2.2.1 to B2.2.3 • Chapters 1, 2, 3

What counts as an organelle, cell fractionation, separating transcription from translation, and the advantages of compartments, with lysosomes and phagocytic vacuoles

BY THE END, STUDENTS CAN

- [ ] Say which parts of a cell are organelles and which are not, and how cell fractionation let biologists study them one at a time B2.2.1
- [ ] Explain the advantage of separating transcription in the nucleus from translation in the cytoplasm B2.2.2
- [ ] Explain how compartments concentrate enzymes and substrates and keep incompatible processes apart, with lysosomes and phagocytic vacuoles B2.2.3

TIMING

0–6	6 min	Do now: organelle or not?	
6–20	14 min	Pull the cell apart	
20–32	12 min	A wall round the genes	
32–48	16 min	The kitchen and the bin	
48–60	12 min	Exit	
	60 min	One lesson	

STARTER

6 min

Do now: organelle or not?

Ten names on the board: nucleus, ribosome, cell wall, cytoplasm, vesicle, cytoskeleton, plasma membrane, lysosome, mitochondrion, starch grain. Pairs sort them into organelle and not, with a reason for each.

ON THE BOARD, FROM THE GUIDE

Open the guide on the projector at each chapter (the links work in this PDF). Every figure plays from its own buttons, and the lesson's slides have the same figures, step by step, in the order of this plan.

01 Rooms with jobs

CHAPTER 01 IN THE SLIDES

Step through the figure (4 steps, the arrow keys on a projector). Stop on each caption and ask what changed before you go on.

1. Cells are broken open in a **cold, isotonic buffer**. Everything is still mixed.
2. A slow spin: the biggest, densest parts, the **nuclei**, settle as a pellet.
3. The liquid goes into a new tube and is spun faster: now the **mitochondria** settle.
4. Faster still: the smallest parts, **ribosomes** and bits of membrane, come down last.

> **Predict box:** Why is the buffer used in fractionation kept ice cold and at the same concentration as the cytoplasm? Hands up or mini whiteboards first.
>
> **Answer B: Cold slows enzymes that would digest the organelles, and the same concentration stops osmosis bursting them**

02 Genes behind a wall

CHAPTER 02 IN THE SLIDES

Switch the figure through Prokaryote and Eukaryote, and have the class say what will change before each.

> **Predict box:** What could go wrong if ribosomes reached a eukaryote's mRNA before it left the nucleus? Hands up or mini whiteboards first.
>
> **Answer B: The ribosomes would translate the introns too, making a faulty protein**

03 Keep it apart, keep it close

CHAPTER 03 IN THE SLIDES

Step through the figure (4 steps, the arrow keys on a projector). Stop on each caption and ask what changed before you go on.

1. A white blood cell's membrane flows round a **bacterium**.
2. The bacterium is inside, in a **phagocytic vacuole**. Lysosomes are close by.
3. **Lysosomes fuse** with the vacuole, adding their enzymes in an acid compartment.
4. The bacterium is **digested**; the small molecules made are used by the cell.

> **Predict box:** A lysosome leaks a little of its contents into the cytoplasm. Why does this do the cell little harm? Hands up or mini whiteboards first.
>
> **Answer C: The enzymes work best at an acid pH and are much less active at the pH of the cytoplasm**

THE LESSON

14 min

Pull the cell apart

Chapter 1 and its figure. Then the fractionation puzzle below: pairs predict which pellet each organelle ends up in, and why the buffer is cold and isotonic.

12 min

A wall round the genes

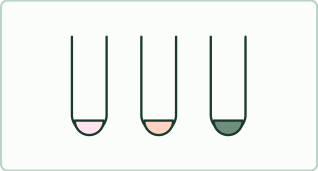
Chapter 2, switching between the prokaryote and the eukaryote. Students draw a two-row comparison: where transcription and translation happen, and what can be done to the mRNA in between.

16 min

The kitchen and the bin

Chapter 3 and its figure, then the house analogy below: groups map each organelle to a room or part of a house and argue where the analogy breaks.

ACTIVITIES



PUZZLE

Which pellet?

Cards for nuclei, mitochondria, chloroplasts, ribosomes, lysosomes and bits of ER, each with its size. Pairs place them in the pellet of the slow, faster or fastest spin, then answer two questions: why is the liquid poured into a new tube each time, and what would happen to the organelles in pure water? The point to land: a new tool, the ultracentrifuge, made a new kind of study possible.

Needs: the cards printed, one set per pair.

ANALOGY

The cell as a house

Groups match each organelle to part of a house: the nucleus as the office where the plans are kept, ribosomes as the cooks, lysosomes as the bin and the recycling, the Golgi as the post room, mitochondria as the boiler. Then each group names one way its analogy fails, such as a bin that would digest the house if it leaked. The best failures go on the board.

Needs: sugar paper and pens per group.

HOMEWORK

Organelle crossword

A crossword of the unit's organelles and terms, with clues written as functions, not definitions: "where proteins for export are threaded in" for rough ER. Students write the clue for one extra word of their own.

Needs: the crossword printed.

REVIEW

Cells escape room

The site's cells escape room (linked under "Related") makes a revision lesson for the end of the unit: five locks of four questions each, for teams. The dominoes and Tarsia puzzle for B2.2 are quieter alternatives.

Needs: one device per team.

PLENARY

12 min

Exit

Two advantages of compartments, each with an example from the lesson. Then the organelle crossword for homework.

WHAT STUDENTS GET WRONG

"Organelles always have a membrane." Ribosomes have none and are organelles; the plasma membrane is one too.

"The cytoplasm is an organelle." It is the whole contents inside the membrane, organelles included, not a discrete part.

"Lysosomes release enzymes into the cytoplasm to digest waste." The digestion happens inside membrane: in the lysosome or the vacuole it fuses with.

STRETCH AND SUPPORT

Support: give the captions of each figure and the film as a cut-up storyboard to put in order, and use the key terms (tap the dotted words) as a glossary.

Support: a word bank for the house analogy, with each organelle's job in five words.

Stretch: prokaryotes manage without membrane compartments. Suggest why being small makes that possible.

IN THE GUIDE

1 Rooms with jobs
2 Genes behind a wall
3 Keep it apart, keep it close
All The whole guide, with the figures that play
PPTX This lesson's slides, in the order of this plan

EXAM PRACTICE

Check yourself

Set it for homework: a fresh paper of exam-bank questions on B2.2 at standard level each time, marked as students go and saved to their Exam practice when they are signed in.

biologybybradford.com/exam-maker/sit?topics=B2.2&level=SL&paper=quiz&marks=15&src=ep

PRACTISE AND REVISE

BUILD FOR YOUR CLASS

- Tarsia puzzle, dominoes and picture reveal on B2.2, built from its key terms and ready to print
- A pub quiz with rounds on B2.2, to present or run with no projector
- An escape room built from the question bank on B2.2

ALREADY ON THE SITE FOR B2.2

- Lesson: Organelles & Compartmentalisation
- Lab: The Endomembrane System
- Quiz: Organelles
- Revision map: B2.2 Organelles and compartmentalization, to fill in
- Exam questions: B2.2 in the exam maker, a paper with its markscheme

CARD SETS ON SPLYCR

Open a set to host it as a class game, or make a copy to edit.

- B2.2–B3.2 Organelles, Gas Exchange & Transport

How this was made. The course structure, the activities and the teaching choices come from my own classroom, my presentations and my years of teaching IB and AP Biology. I use Claude, an AI, to help write and build the interactive guides, lesson plans, slides and practice questions, and to draw the diagrams and code the interactives. I direct the work and review it against the IB and AP specifications before it goes live.