Rooms with jobs

60 minutes • 2.1.A • Chapters 1, 2, 3, 4, 7

What every cell has, prokaryotic and eukaryotic cells, ribosomes, and the nucleus, ER, Golgi, lysosomes and vacuoles of a eukaryote, plant and animal

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BY THE END, STUDENTS CAN

- [ ] Name the four structures every cell has and compare prokaryotic and eukaryotic cells 2.1.A
- [ ] Describe ribosomes and explain why their presence in all life is evidence of common ancestry 2.1.A
- [ ] Describe the structure and function of the nucleus, rough and smooth ER, Golgi complex, lysosomes and vacuoles 2.1.A
- [ ] Explain how the folded inner membrane of a mitochondrion and the thylakoids of a chloroplast let a cell capture and use energy 2.1.A
- [ ] Compare plant and animal cells and identify cells and organelles in electron micrographs 2.1.A

TIMING

0–5	5 min	**Do now: the bare minimum**	
5–12	7 min	**No rooms, and one in every cell**	
12–21	9 min	**Room by room**	
21–52	31 min	**Real cells**	
52–60	8 min	**Exit**	
	60 min	**One lesson**	

STARTER

5 min

Do now: the bare minimum

"You are designing the simplest possible living cell. What four things can it not do without?" Pairs list four, then compare with chapter 1's figure as it plays through.

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 Every cell, the same four parts

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. Both cells are wrapped in a **plasma membrane** made of lipids.
2. Both are filled with **cytoplasm**, which is mostly water.
3. Both have **DNA**: a loop in the bacterium, chromosomes in the animal cell's nucleus.
4. Both have **ribosomes** to make proteins, though of different sizes.

> **Predict box:** A new single-celled organism is found in a hot spring. Which of these must it have? Hands up or mini whiteboards first.
>
> **Answer B: Ribosomes, DNA, cytoplasm and a plasma membrane, whatever kind of cell it turns out to be**

02 A cell with no rooms

CHAPTER 02 IN THE SLIDES

Tap the parts of the figure in turn: Flagellum, Cell wall, Plasma membrane, Cytoplasm, Nucleoid, Plasmid and Ribosomes.

> **Predict box:** A drug blocks the ribosomes of bacteria but not ours. Why could it still stop a bacterium growing, though bacteria have no organelles for it to target? Hands up or mini whiteboards first.
>
> **Answer B: Every cell needs ribosomes to make its proteins, and bacteria have their own, built differently from ours**

03 The one structure in every cell

CHAPTER 03 IN THE SLIDES

Switch the figure through Free and On the rough ER, and have the class say what will change before each.

> **Predict box:** A cell secretes large amounts of a digestive enzyme. Where would you expect most of its ribosomes to be? Hands up or mini whiteboards first.
>
> **Answer C: Bound to the rough ER, which takes the enzyme in as it is made and sends it on toward the membrane**

04 A eukaryotic cell, room by room

CHAPTER 04 IN THE SLIDES

Tap the parts of the figure in turn: Cytoskeleton, Nucleus, Rough endoplasmic reticulum, Golgi complex, Smooth endoplasmic reticulum, Mitochondrion, Lysosome, Vesicle, Centrioles, Free ribosomes and Plasma membrane.

> **Predict box:** Liver cells break down drugs and alcohol. Which organelle would you expect a liver cell to have a lot of? Hands up or mini whiteboards first.
>
> **Answer B: Smooth ER, whose enzymes break down toxins such as drugs and alcohol into forms the body can get rid of**

07 Plant cell, animal cell

CHAPTER 07 IN THE SLIDES

Tap the parts of the figure in turn: Cell wall, Plasma membrane, Plasmodesmata, Central vacuole, Ribosomes, Nucleus, Rough endoplasmic reticulum, Golgi complex, Vesicle, Vesicle, Chloroplast, Chloroplast, Chloroplast, Chloroplast, Mitochondrion and Mitochondrion.

> **Predict box:** A cell from an onion bulb has a wall and a large vacuole but no chloroplasts. What is it? Hands up or mini whiteboards first.
>
> **Answer C: A plant cell that grows out of the light, so it has the wall and central vacuole but makes no chloroplasts**

THE LESSON

7 min

No rooms, and one in every cell

Chapter 2's bacterium: tap the nucleoid, the wall and the ribosomes. Then chapter 3's figure, free and bound. Ask why ribosomes, and nothing else inside, turn up in every cell ever found.

9 min

Room by room

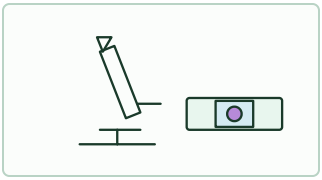
Chapter 4's animal cell on the board: students call out a job ("makes lipids", "breaks down old parts") and a volunteer taps the organelle that does it. Then chapter 7's plant cell: what is there that was not, and what is missing?

31 min

Real cells

The microscopy practical below: onion epidermis in iodine, cheek cells in methylene blue, and a nail varnish peel of a leaf for guard cells. Each pair draws one cell of each and labels what they can see, and says which structures from the figures are too small to see with a light microscope.

ACTIVITIES

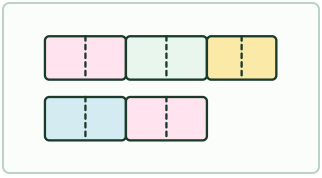


PRACTICAL

Real cells

Three mounts. Onion: peel the thin skin from the inside of a bulb leaf, lay it flat in a drop of iodine and add a coverslip. Cheek: scrape the inside of the cheek gently with a clean cotton bud, smear it on a slide and add methylene blue. Leaf: paint clear nail varnish on the underside of a leaf, let it dry, lift it with clear tape and stick it to a slide to see the guard cells. Students focus on low power first, then high, and draw a few cells of each with a scale.

Needs: microscopes, slides and coverslips, an onion, iodine solution, methylene blue, cotton buds (each used once, then into disinfectant), clear nail varnish, clear tape, a leaf, eye protection.



GAME

Organelle dominoes

A loop of cards, each with a structure on one half and the job of a different structure on the other ("has a folded inner membrane where ATP is made"). Groups join them into a closed ring; a wrong join leaves a card with no partner. The site's dominoes maker builds a set from this unit's terms (in the last card below), or groups write their own on blank cards and swap.

Needs: a printed set per group, or blank cards and pens.

PLENARY

8 min

Exit

On paper: "Compare a bacterium with a plant cell: two similarities and two differences" (4 marks). Then chapter 4's predict box on the liver for anyone who finishes.

WHAT STUDENTS GET WRONG

"Prokaryotes have no DNA." They have no nucleus; the DNA lies in the nucleoid.

"The cell wall controls what enters the cell." The wall lets most things through; the plasma membrane controls.

"The Golgi makes proteins." Ribosomes make them; the Golgi modifies, sorts and ships them.

"Plant cells have chloroplasts instead of mitochondria." They have both.

STRETCH AND SUPPORT

Stretch: a cell makes and exports large amounts of an enzyme. Predict three organelles it will have a lot of, and give a reason for each.

Support: a table of organelles with the "job" column started, filled in while tapping chapter 4's figure.

For revision: students can drill this unit's key terms on Cramly.

IN THE GUIDE

1 Every cell, the same four parts

2 A cell with no rooms

3 The one structure in every cell

4 A eukaryotic cell, room by room

7 Plant cell, animal cell

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 2.1, 2.2 each time, marked as students go and saved to their Exam practice when they are signed in.

biologybybradford.com/exam-maker/sit?program=ap&units=U2&ced=2.1,2.2&paper=quiz&marks=15&src=ep

PRACTISE AND REVISE

BUILD FOR YOUR CLASS

- Tarsia puzzle, dominoes and picture reveal on Unit 2, built from its key terms and ready to print
- A pub quiz with rounds on Unit 2, to present or run with no projector
- The Cell Factory Lockdown escape room, or an escape room built from the question bank on Unit 2

ALREADY ON THE SITE FOR UNIT 2

- Lesson: The Endomembrane System in Action
- Lesson: Cell Structure & Size
- Lab: The Endomembrane System
- Quiz: Cell Structure & Cell Size
- Exam questions: Unit 2 in the exam maker, a paper with scoring guidelines

CARD SETS ON SPLYCR

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

- Unit 2: Cell Structure and Function (part 1)
- Unit 2: Cell Structure and Function (part 2)
- Unit 2: Cell Structure and Function (part 3)

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.