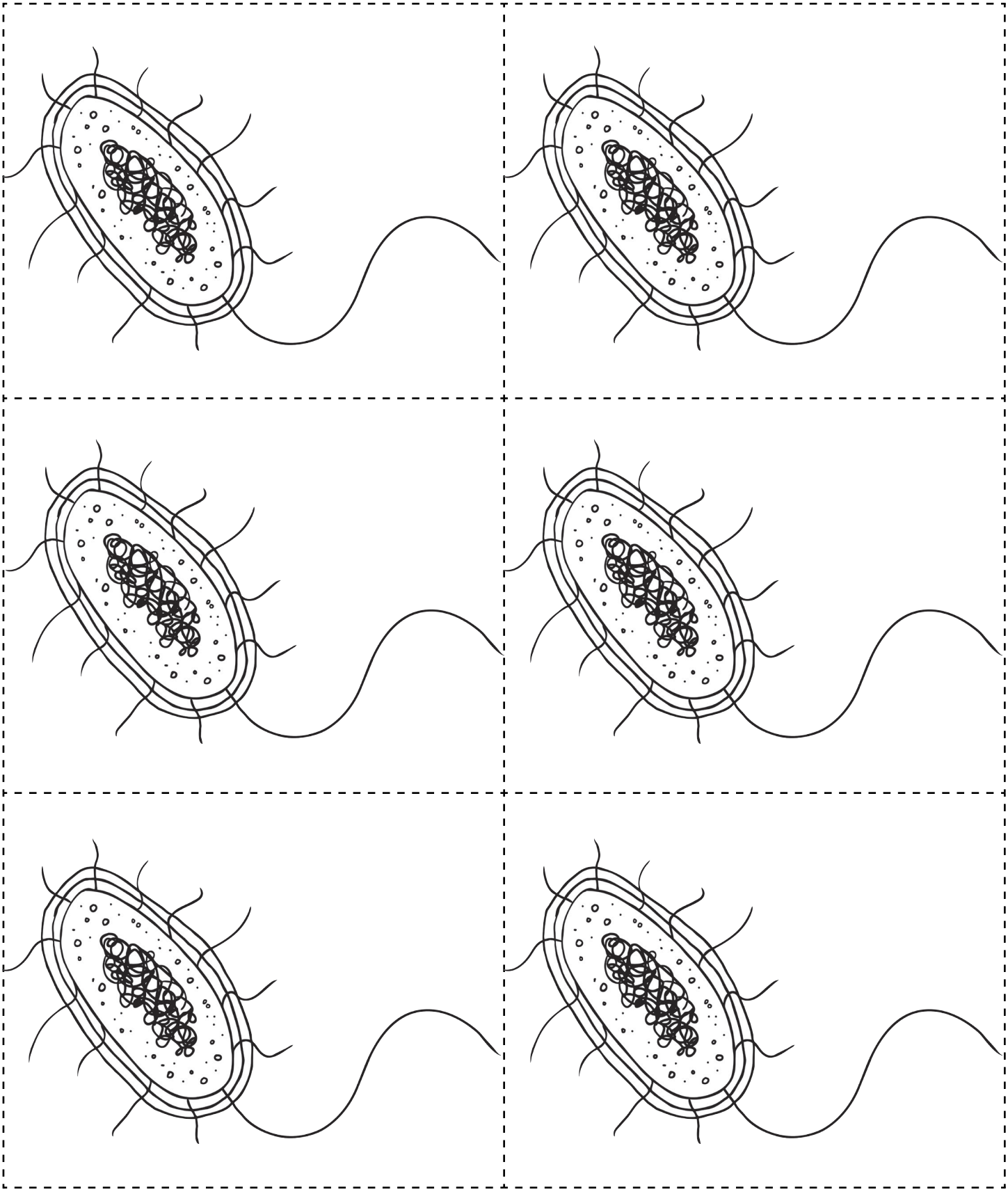
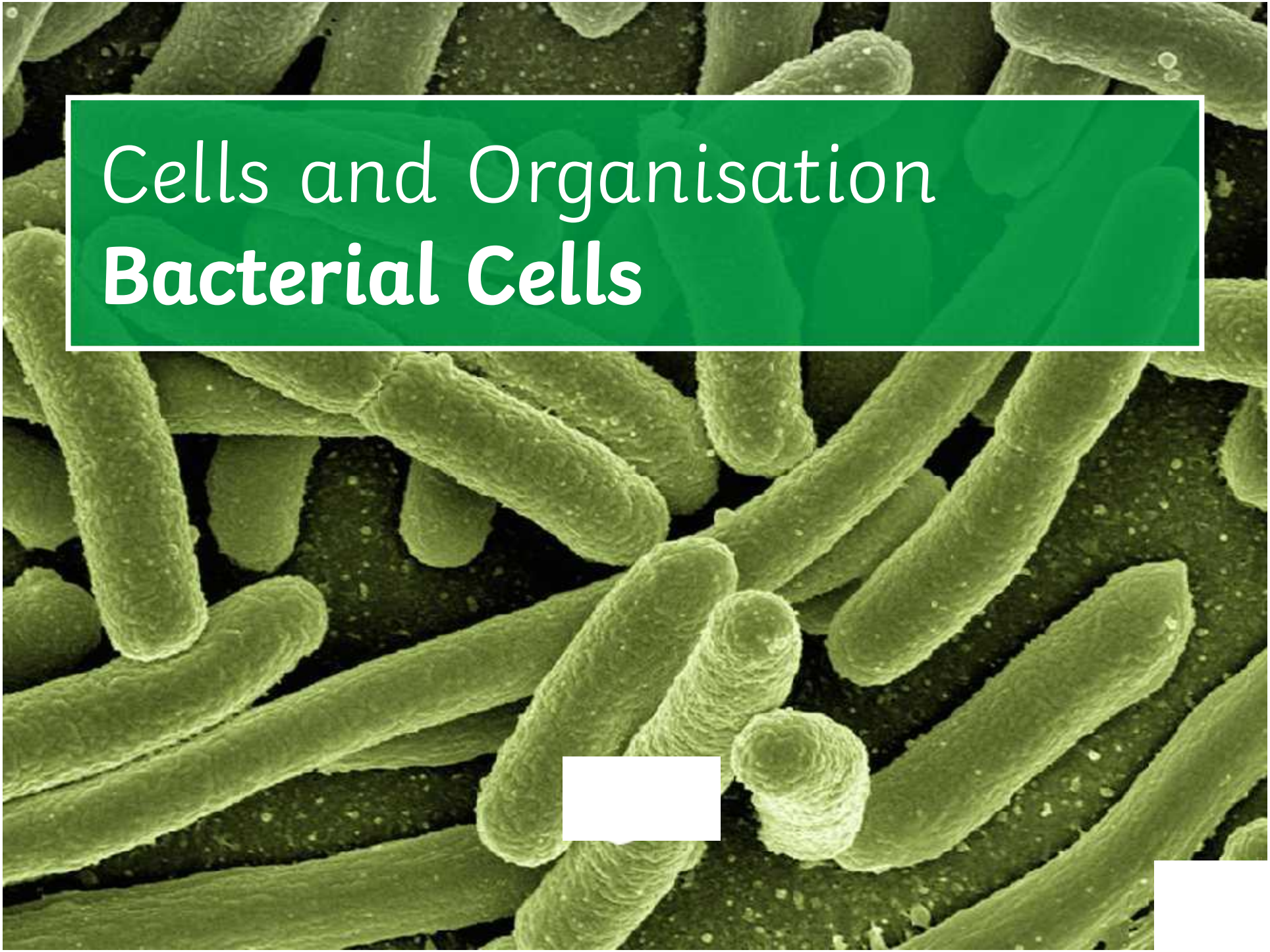
Bacteria Cell Diagram





Cells and Organisation
Bacterial Cells

Learning Objective

- To explain how unicellular organisms are adapted to carry out functions that in multicellular organisms, are done by different types of cell.

Success Criteria

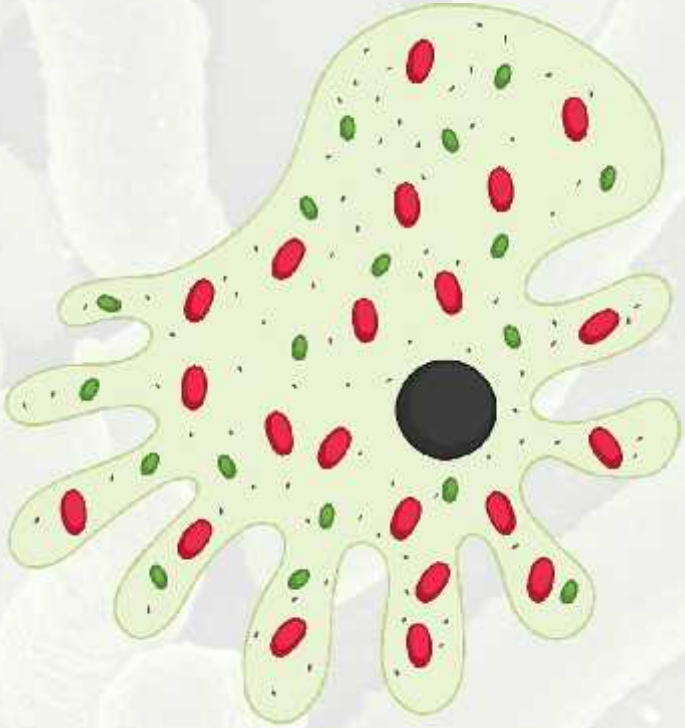
- To identify the organelles found in bacterial cells.
- To explain how bacterial cells are adapted to carry out specific functions.
- To compare bacterial, plant and animal cells and justify the differences between them.

An Alien Cell

A comet has landed on earth and scientists have found some alien cells on it!

They want to know if it's a plant or animal cell, what do you think?

Be prepared to justify your choice.



I See, You Draw

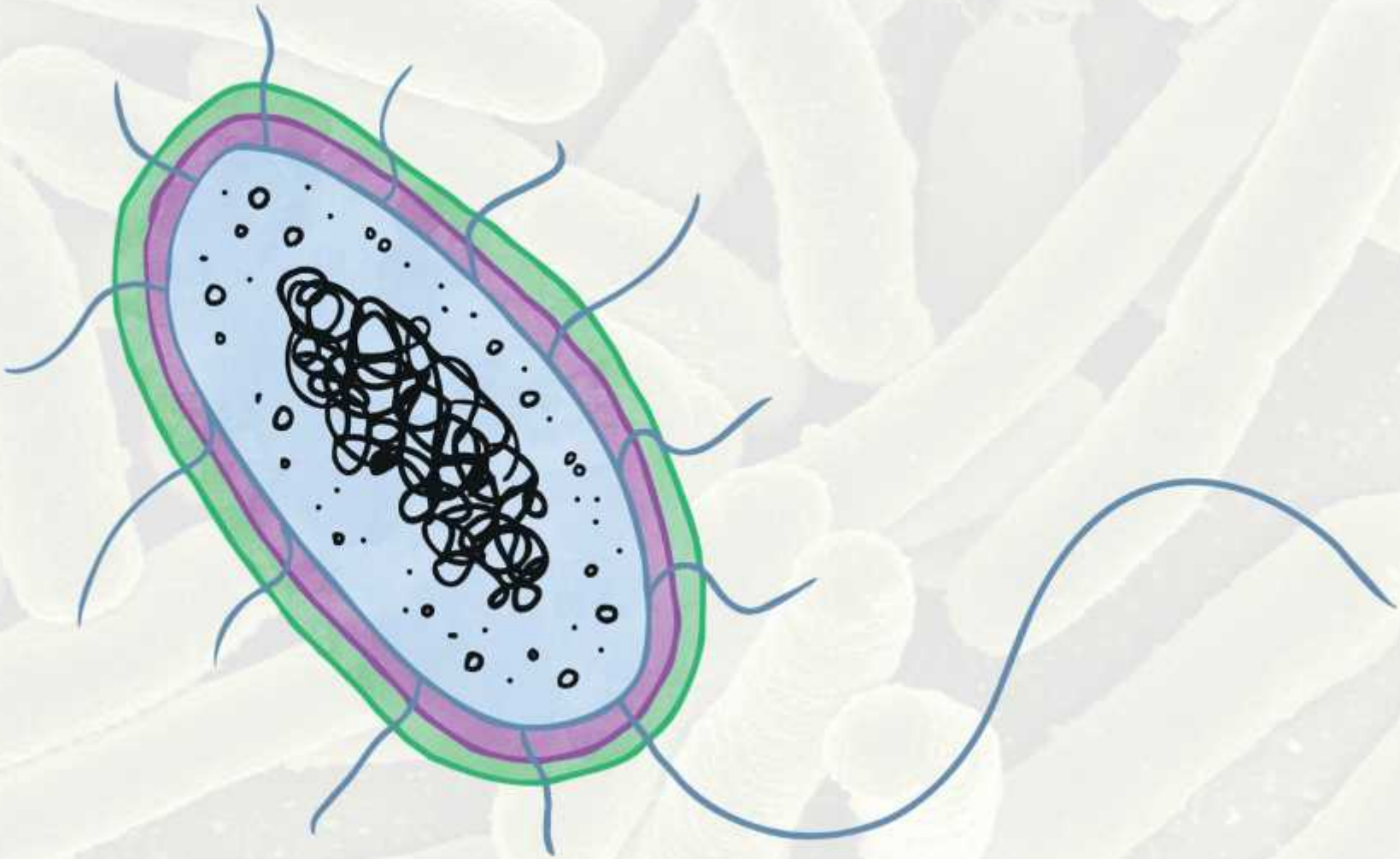
With a partner, turn your chairs so they are facing back-to-back.
Person 1 will have a diagram in front of them. They will be describing the diagram to person 2.

Person 2 has to listen carefully to person 1's instructions and draw the diagram as it is described.

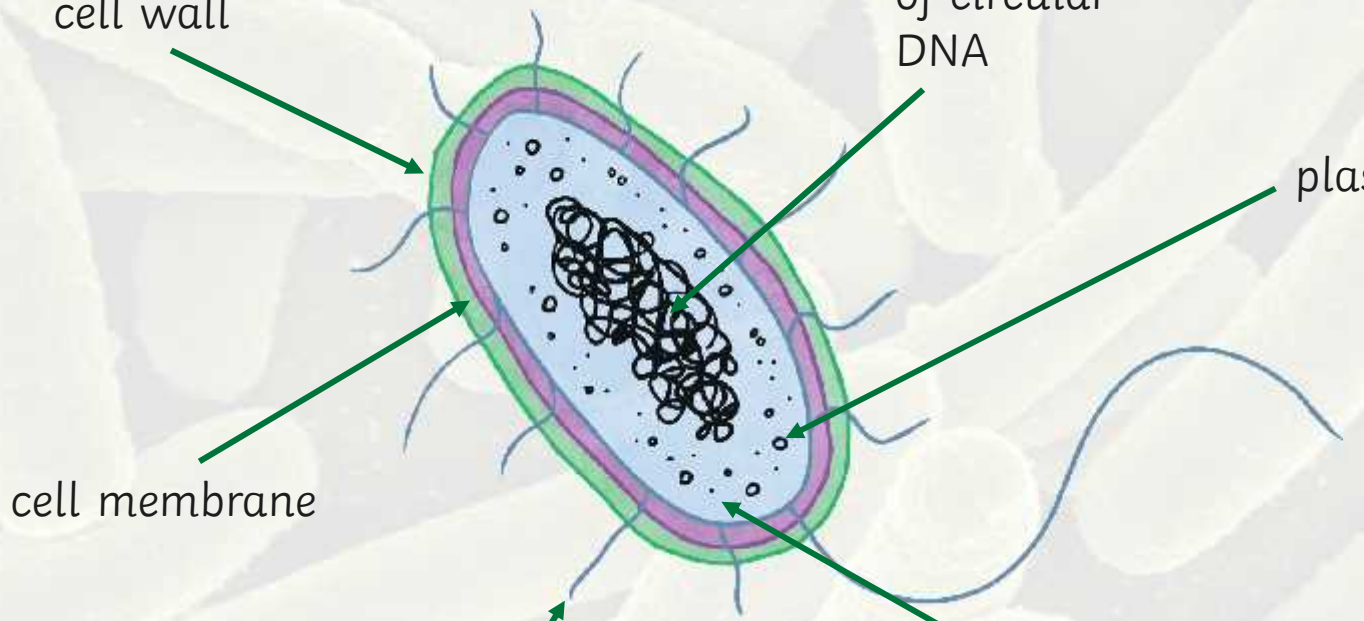
There must be no turning around. Person 2 must not see the diagram. Person 1 must not see the drawing.

You can ask each other as many questions as you like.

I See, You Draw



A Bacterial Cell



Comparing Cell Types

	Animal Cell	Plant Cell	Bacterial Cell
nucleus	✓	✓	
circular DNA			✓
mitochondria	✓	✓	
chloroplasts		✓	
cell wall		✓	✓
cell membrane	✓	✓	✓
cytoplasm	✓	✓	✓
flagellum			✓
vacuole		✓	
plasmids			✓

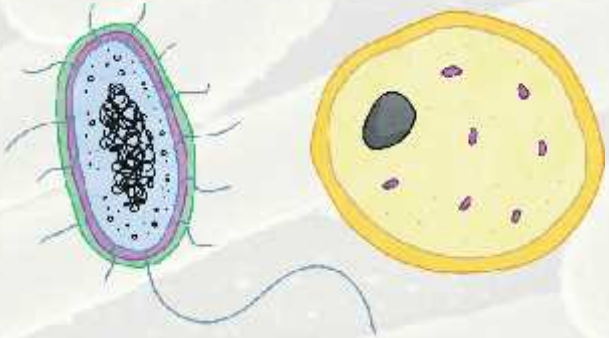
Keywords

unicellular

multicellular

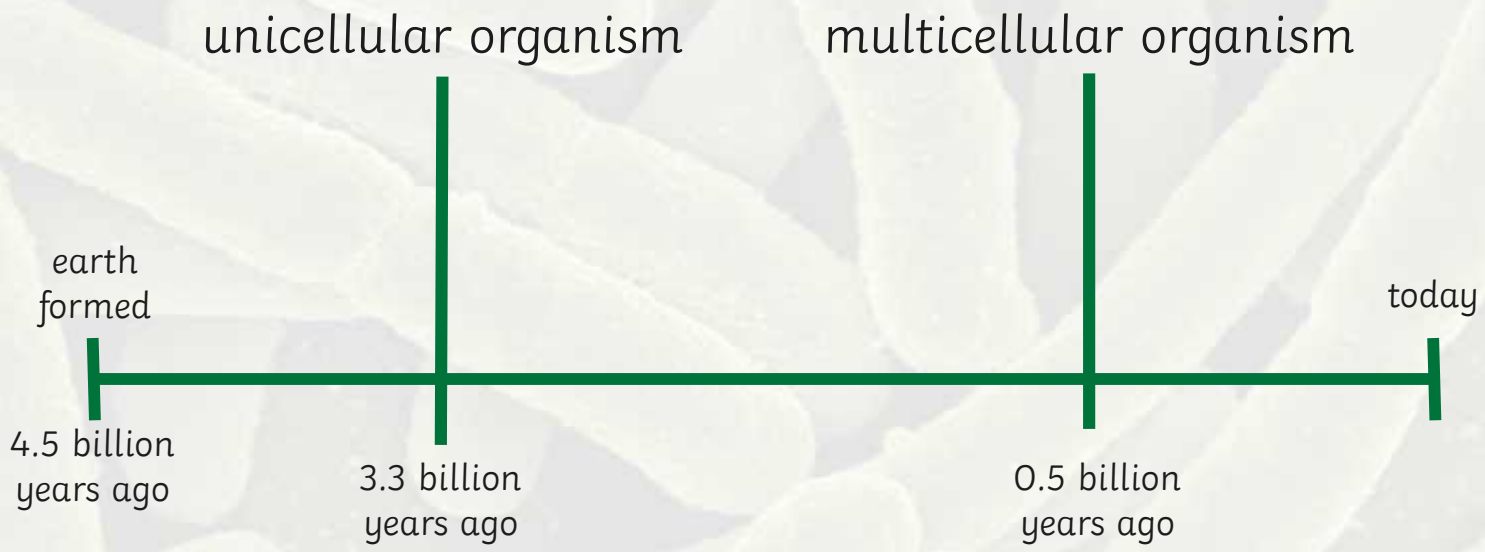
What do you think these words mean?

Living thing made up of one type of cell.



Living thing made up of many types of cell.

Keywords: Timeline



All complex organisms that have more than one cell have arisen in the last 0.5 billion years. Can you suggest why being multicellular resulted in such an explosion in the variety of organisms?

Bacterial Cell Adaptations

A single bacterial cell has to carry out all its jobs by itself, that's pretty clever!

How is it adapted to do it all?

Helps to move the bacteria along.	flagellum
Carries extra genetic information that helps them adapt if the environment changes.	plasmid
Gives the cell structure.	cell wall

Extended Writing

Compare a plant cell, an animal cell and a bacterial cell, and explain why they are different. (6 marks)

In exam questions, the command word is used to tell you how to answer the question.

What does the command word **compare** want you to do?

Extended Writing

Compare a plant cell, an animal cell and a bacterial cell, and explain why they are different. (6 marks)

In exam questions, the command word is used to tell you how to answer the question.

What does the command word **compare** want you to do?

Describe similarities and/or differences between things, don't just write about one.

Extended Writing

Compare a plant cell, an animal cell and a bacterial cell, and **explain** why they are different. (6 marks)

In exam questions, the command word is used to tell you how to answer the question.

What does the command word **explain** want you to do?

Extended Writing

Compare a plant cell, an animal cell and a bacterial cell, and **explain** why they are different. (6 marks)

State the reasons for something

In exam questions, the command word is used to tell you how to answer the question.

What does the command word **explain** want you to do?

Peer Assessment

Use the mark scheme to give your partner a mark out of six for their answer so far. Then in the box underneath, give them some feedback to help them improve their work. You may want to choose some of the advice below, or come up with your own, but make sure it's useful to your partner!

You have described one type of cell, but you have not compared it to the other cell types. You need to describe how the other cells are similar or different.

You have compared the cell types, but you have not explained why they are different. You need to add some reasons for the differences between them.

You have compared the cell types and explained why they are different, but you have only covered one organelle. You now need to repeat this structure for a different organelle.

Improvements

Use the feedback from your peer, and the mark scheme, to add an additional paragraph that will improve your answer.

Write a sentence that compares an organelle in **all three** cell types.

Use a conjunction to link these two sentences.

Write a sentence that explains why the cells have these similarities or differences.

Homework Activity

You will need to learn the names and the functions of all of the organelles.

Make yourself some revision notes to help you learn them, the more creative you are with these the more useful they will be.

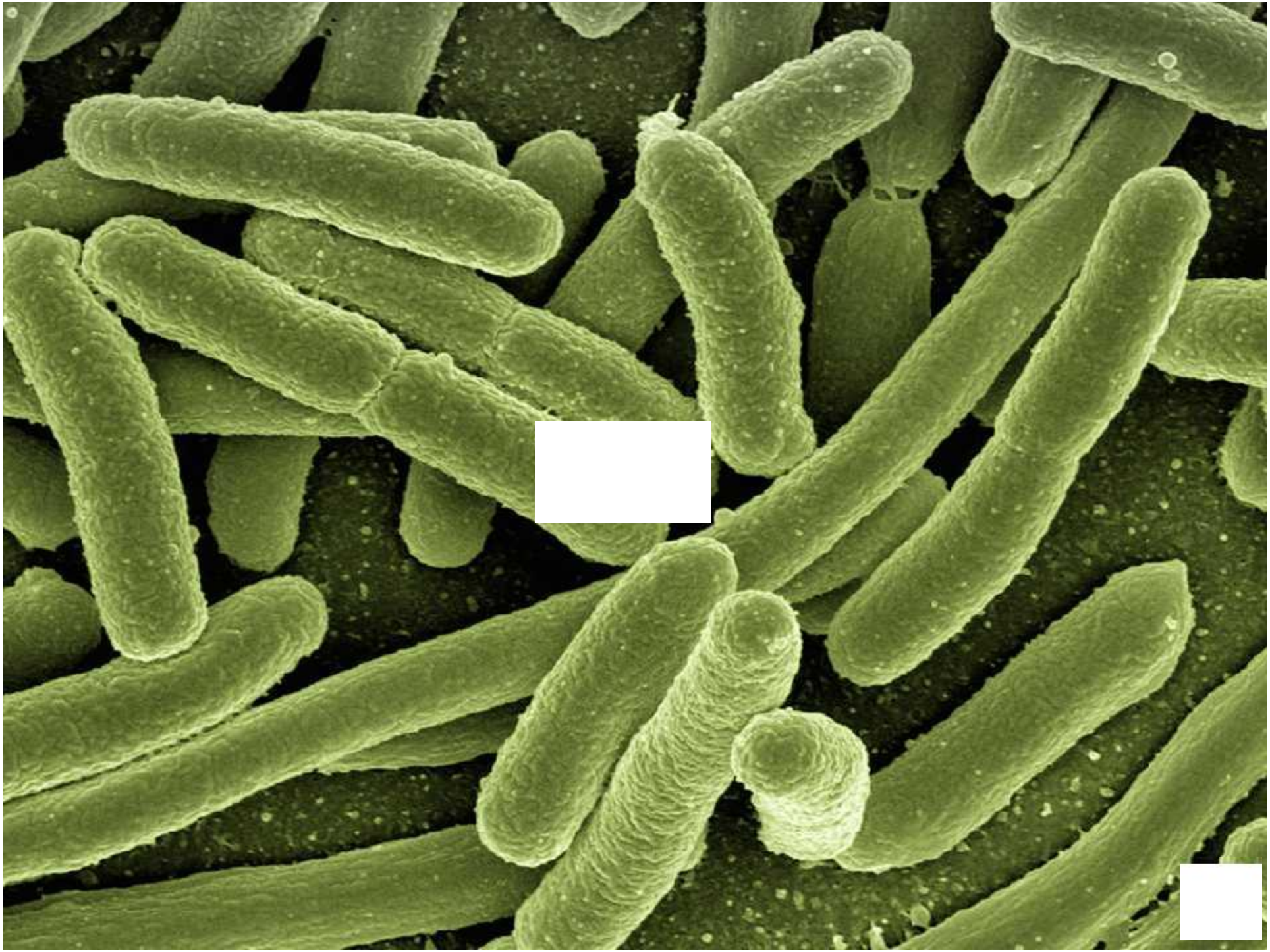
Draw cartoon versions of the organelles explaining what they do for a job.

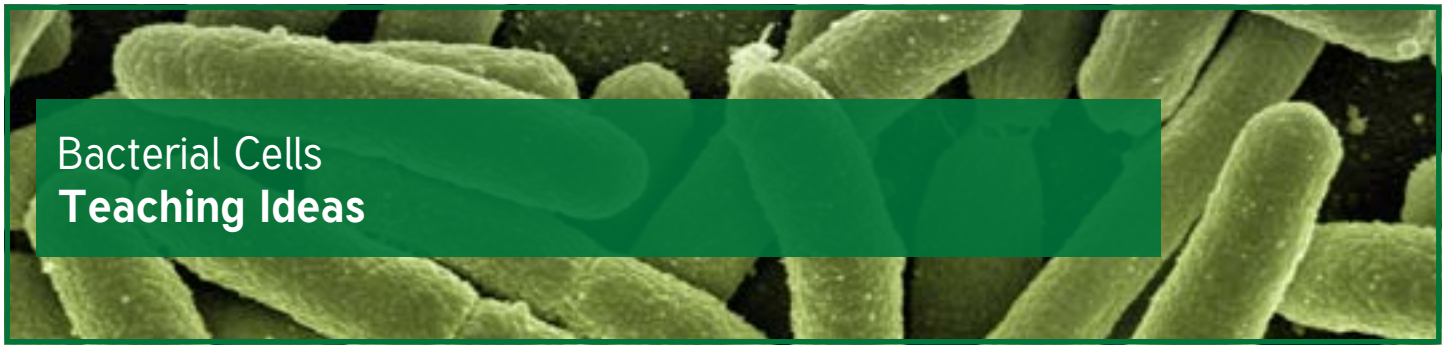
Make a glossary to pin up in your house.

Make some flash cards so your friends and family can help to test you.

Write a story that includes all the information.

Make a PowerPoint presentation and use it to teach someone else what you've learnt.





Bacterial Cells
Teaching Ideas

		Resources
Learning Objective:	To explain how unicellular organisms are adapted to carry out functions that in multicellular organisms, are done by different types of cell.	**Lesson Pack**
Success Criteria:	• To identify the organelles found in bacterial cells. • To explain how bacterial cells are adapted to carry out specific functions. • To compare bacterial, plant and animal cells and justify the differences between them.	Optional: mini whiteboards and pens.
Context:	This is the third lesson of the cells and organisation topic. Students will have already learnt about the organelles and the differences between plant and animal cells in a previous lesson. At key stage 4, students will need to recognise that these are prokaryotic cells, so you may wish to introduce the term in this lesson too.	

Starter

An Alien Cell

This activity provides an opportunity to recap the organelles that students learnt about in a previous lesson. The alien cell is shown to contain a nucleus, mitochondria, chloroplasts and a cell membrane. The cell does not have a vacuole or a cell wall. Students need to identify the organelles that are present and then decide whether they would classify this cell as a plant or animal cell. As this is an alien cell, there is no correct answer – you are looking for students to justify their decision. They might think it's a plant cell because it contains chloroplasts and animal cells do not have them. However, they might decide that it's an animal cell which has gained chloroplasts, since it doesn't contain a cell wall or a vacuole.

This activity can lead into a conversation about the fact that not all cells fit into those standard plant and animal cells, and many can look quite different to the standard cells they have learnt about. Next lesson they will look more closely at specialised cells.

Main Activities

I See, You Draw

This activity is a way to introduce the basic structure of a bacterial cell. It is a nice way to get the students studying the structure of the cell in detail. Students turn their chairs so they are sitting back-to-back. Student 1 can see a diagram of a bacterial cell, while student 2 has a whiteboard and pen (or paper and pencil). Student 1 describes the cell and student 2 has to draw it as described. Student 1 must not see the drawing and student 2 must not see the diagram. Slide 5 has a big diagram of the cell on it, so you could choose to have half of the class facing the board, and the other half facing the opposite side of the room (make sure there is nothing that will show the reflection of the board on the back wall). Alternatively, you could cut out the **Bacterial Cell Diagrams** and hand these out to one student in every pair. It might be less tempting for the students to try and peek if you use the smaller diagrams instead of the board.

Set a time limit for the activity, and then ask the students to show each other the diagram and drawing. You could pick out some that were very similar and some that were very different to show to the rest of the class. For the students who drew similar pictures, ask them to explain the descriptions they gave, did they say, "It has lots of chloroplasts." Rather than it has lots of green dots. Did that help to get the drawing more accurate?

Afterwards, display the bacterial cell diagram on the board, ask the students what is similar to plant and animal cells and what is different. Which organelles are they able to identify that they've seen before? Are there any new ones?

There is space for students to draw and label a diagram of the cell on the **Bacterial Cell Activity Sheet**, you might want to hide the image on the board and only flash it up for a couple of short periods while they are drawing, to help students start to commit the features to memory. The lower ability version of the sheet has the keywords on the sheet.

Comparing Cell Types

Slide 7 shows a table of all the organelles the students have now seen and asks them to tick which cell types it is found in. You could have students copy the table into their books or answer on the **Bacterial Cell Activity Sheet**. The table provides them with a summary of the facts they need and will be a good revision tool. It will be useful for them to have the table to refer to when completing the extended writing task later in the lesson.

Keywords

Slide 8 introduces the students to the terms multicellular and unicellular, and asks them to suggest what they mean. If you don't have any suggestions straight away then you could break down the words and ask them what the prefixes 'multi' and 'uni' mean, and what the cellular part refers to. On a click, there are definitions and examples of each. Unicellular organism examples are a bacterial cell and a yeast cell, multicellular examples are plant and animal cells.

Slide 9 shows a timeline for the appearance of unicellular and multicellular organisms, it starts to set the scene for the next lesson on specialised cells. You may decide to only use this slide with your higher ability students. The question asks them why there was an explosion of organisms once they became multicellular. Tease out from the students that it means the cells only needed to focus on one job, because there are lots of other cells to do the other jobs. While in a unicellular organism, the cell needs to do everything. As multicellular organisms can have many cell types doing different jobs, they are more able to evolve into the wonderful variety of organisms we see today! You could explain this with a couple of analogies:

In primary school, the students had one teacher who taught them everything they needed to learn in school. They had to teach lots of topics, so they couldn't know each topic in lots of detail. Now they are in secondary school, they have a different teacher for each subject! This means the teacher only needs to know about one subject, so they know it in a lot more detail. Secondary school teaches them more complex information about a wider range of subjects because they have lots more teachers. This means they can be a lot more specialised.

Alternatively, think of a unicellular organism as a penknife, or multitool. The tool has lots of attachments, so it can do lots of jobs, even though its only one tool. However, the scissors are small and difficult to use, and if you wanted to chop up a joint of beef or a full chicken with a penknife, you'd be there all day. You'd be able to carry out those tasks a lot more effectively with a big knife, or a proper pair of scissors, because those tools are made to be great at their one job and they don't need to worry about any others. This is like a multicellular organism, it's a draw full of tools!

Higher ability students can write definitions of unicellular and multicellular on their **Bacterial Cell Activity Sheet**, while the lower ability sheet asks students to write the key word next to the correct definition.

Bacterial Cell Adaptations

Slide 10 has a look at some of the adaptations that a bacterial cell has that help it as a multicellular organism. The adaptations are given on the slide, ask the students to look at their diagrams and suggest which features of the bacterial cell are linked to each adaptation.

The cell wall provides structure to the bacterium, this is also needed in plant cells, but not in animal cells as they have specialised structures in the body to support it. The bacteria's cell wall is more flexible than a plant's cell wall.

The flagella allow the bacteria to move around its environment, however these are not present on every bacterium.

The plasmids provide a way for bacteria to share genes with other bacteria, this allows them to adapt quickly to a change in environment. It is in the plasmids that you find most of the antibiotic resistance genes. Animal and plant cells wouldn't benefit from these plasmids in the same way, the genes wouldn't be able to be passed to every other cell in the body, so they would have a limited effect. Bacteria can act on the new genetic information more easily in their single cell, and pass this on to daughter cells quickly with divisions as short as every 20 minutes.

Extended Writing

The purpose of this activity is to start to develop the skills that students will need when answering QWC questions in GCSE exams. It will provide a good piece of work to assess.

Slides 11-14 focus on the command words in the questions and give you chance to focus students on what the question is asking them to do. Students will have the information on their **Bacterial Cell Activity Sheet** to use to construct their answer. Give the students 10 minutes to work independently on answering the question on their activity sheet.

The lower ability **Bacterial Cell Activity Sheet** provides more structure to support the students in answering the question.

Slide 15 gives some comments that may be useful to support students in peer assessing each other's work. The **Bacterial Cell Extended Writing Mark Scheme** gives a variety of points that could be made when answering this question. The points are divided into two sections focussed on the comparison part of the question, and the explanation part of the question, to reinforce the importance of recognising these command words to the students. Ask students to swap sheets with a partner, use the mark scheme to give a mark out of 6, and then provide some feedback. They could use one of the statements on the slide, or they could come up with their own.

Plenary

Peer Assessment

Once the students have had their peer assessment mark, give them a few minutes to write a couple of additional sentences to improve their answer in the space provided on the **Bacterial Cell Activity Sheet**.

Slide 16 provides support for the structure of that paragraph if your students need it.

Homework Activity

Ask students to make themselves some revision notes to help them remember all of the organelles and their functions, there are some examples given on the slide, but remind them they are not limited by these!

Bacterial Cells Activity Sheet

Draw and label a diagram of a bacterial cell in the box below. Make sure you include a cell membrane, cell wall, circular loop of DNA, plasmids, cytoplasm and flagellum.

Complete the table by putting a tick in the box if the organelle is present in that cell type.

	Animal Cell	**Plant Cell**	**Bacterial Cell**
nucleus			
circular DNA			
mitochondria			
chloroplasts			
cell wall			
cell membrane			
cytoplasm			
flagellum			
vacuole			
plasmids			

Write the keywords **unicellular** and **multicellular** below the correct definitions.

Living thing made up of many types of cell.

_____

Living thing made up of one type of cell.

_____

Compare a plant cell, an animal cell and a bacterial cell, and explain why they are different. (6 marks)

Use your table above to help you pick the organelles. Here are some other keywords you might need:
photosynthesis support structure movement environment

The _____ cell has _____ but the _____ cell does not, because _____

_____

_____.

The _____ cell has _____ but the _____ cell does not, because _____

_____

_____.

The _____ cell has _____ but the _____ cell does not, because _____

_____

_____.

Peer Assessment

You have achieved /6 marks.

To improve your writing, you need to...

_____

_____

_____

Use the feedback from your peer to write an extra paragraph that will improve your answer to the question above. Remember to **compare** all three cells **and** then **explain** why these differences exist.

_____

_____

_____

_____

Bacterial Cells Activity Sheet

Draw and label a diagram of a bacterial cell in the box below.

Complete the table by putting a tick in the box if the organelle is present in that cell type.

	Animal Cell	Plant Cell	Bacterial Cell
nucleus			
circular DNA			
mitochondria			
chloroplasts			
cell wall			
cell membrane			
cytoplasm			
flagellum			
vacuole			
plasmids			

Write the definitions for the following keywords.

Unicellular:

Multicellular:

Compare a plant cell, an animal cell and a bacterial cell, and explain why they are different. (6 marks)

Peer Assessment

You have achieved /6 marks.

To improve your writing, you need to...

Use the feedback from your peer to write an extra paragraph that will improve your answer to the question above. Remember to **compare** all three cells **and** then **explain** why these differences exist.

Bacterial Cell Extended Writing Mark Scheme

You can award 1-3 marks for statements that have **compared** the three types of cells. Examples of points that could be awarded a mark are given below.

- Bacterial cells and plant cells have cell walls, but animal cells do not.
- Animal and plant cells have their genetic information in a nucleus, bacteria have theirs in a circular loop of DNA.
- Bacterial cells have plasmids, animal and plant cells do not.
- Animal and plant cells have mitochondria, bacteria cells do not.
- All three cell types have a cell membrane and cytoplasm.
- Some bacteria have flagella, animal and plant cells do not have flagella.
- Plant cells have chloroplasts and a vacuole, but animal and bacterial cells do not.

You can award 1-3 marks for statements that have **explained why** the three types of cells are different. Examples of points that could be awarded a mark are given below.

- Bacterial and plant cells need cell walls to give them structure.
- Animal cells do not need cell walls for structure as they have muscle or skeletal structures to provide support.
- Bacterial cells have plasmids so that they can adapt quickly to changes in the environment.
- Plant cells have a vacuole to help provide support.
- Plant cells have chloroplasts so that they can photosynthesise or make their own food.
- Animal cells don't need chloroplasts because animals can catch or collect and eat their own food.
- Some bacteria have flagella so that they can move around in their environment.
- All three cells need a cell membrane so that they can control what moves into and out of the cell.
- All three cells need the cytoplasm because that is where chemical reactions happen.