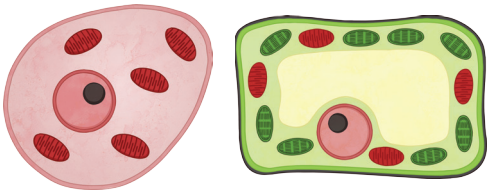
Cells and Organisation Lesson 2 - **Animal and Plant Cells**

Background:

You and your friend have been shrunk into a microscopic world! Your friend is a little scared, so to make them more at ease, you decide to take them on a guided tour of what's around you!



Your Task:

Choose either a plant **or** an animal cell to guide your friend around and describe each part. Look in the keywords box to check what to cover, but remember some are **only** found in plant cells!

How to Present Your Work:

You can draw a cartoon strip with textboxes or speech bubbles or you can produce a piece of creative writing.

Not Sure Where to Start?

Be inspired by one of these story starters:

1. Wow! I was in the garden one minute and now everything's enormous! As I looked up I could see lots of strange green discs floating around and my friend was wondering what they were...
2. What just happened? We were walking the dog but now I can't see him anymore. Hang on, what's that dark circle I recognise...

Finished? Have You:

Keywords:

☐ Taken care with your presentation?

☐ Checked your spelling with the keywords box?

☐ Written your name on your work?

Remember to check what to include, depending on whether you are guiding around a plant or animal cell.)

cell membrane	chloroplasts	mitochondria	vacuole
cell wall	cytoplasm	nucleus	

Cells and Organisation Lesson 2 - **Peer Assessment Feedback Sheet**

Name of person reading your work: _____

What I liked about your work was: _____

_____

_____

_____

_____

I think you could have: _____

_____

_____

_____

_____

Signed: **Dated:**

Cells and Organisation Lesson 2 - **Peer Assessment Feedback Sheet**

You have correctly used some keywords.	You have correctly spelt some keywords.	You have correctly spelt all keywords.
You have included at least 2 correct parts of your type of cell.	You have included most of the correct parts of your type of cell.	You have included all of the correct parts of your type of cell.
You have copied the descriptions of each part of the cell.	You have changed some of the words in the description of each part of the cell.	You have shown creativity and understanding by writing your own descriptions.

Next Steps: _____

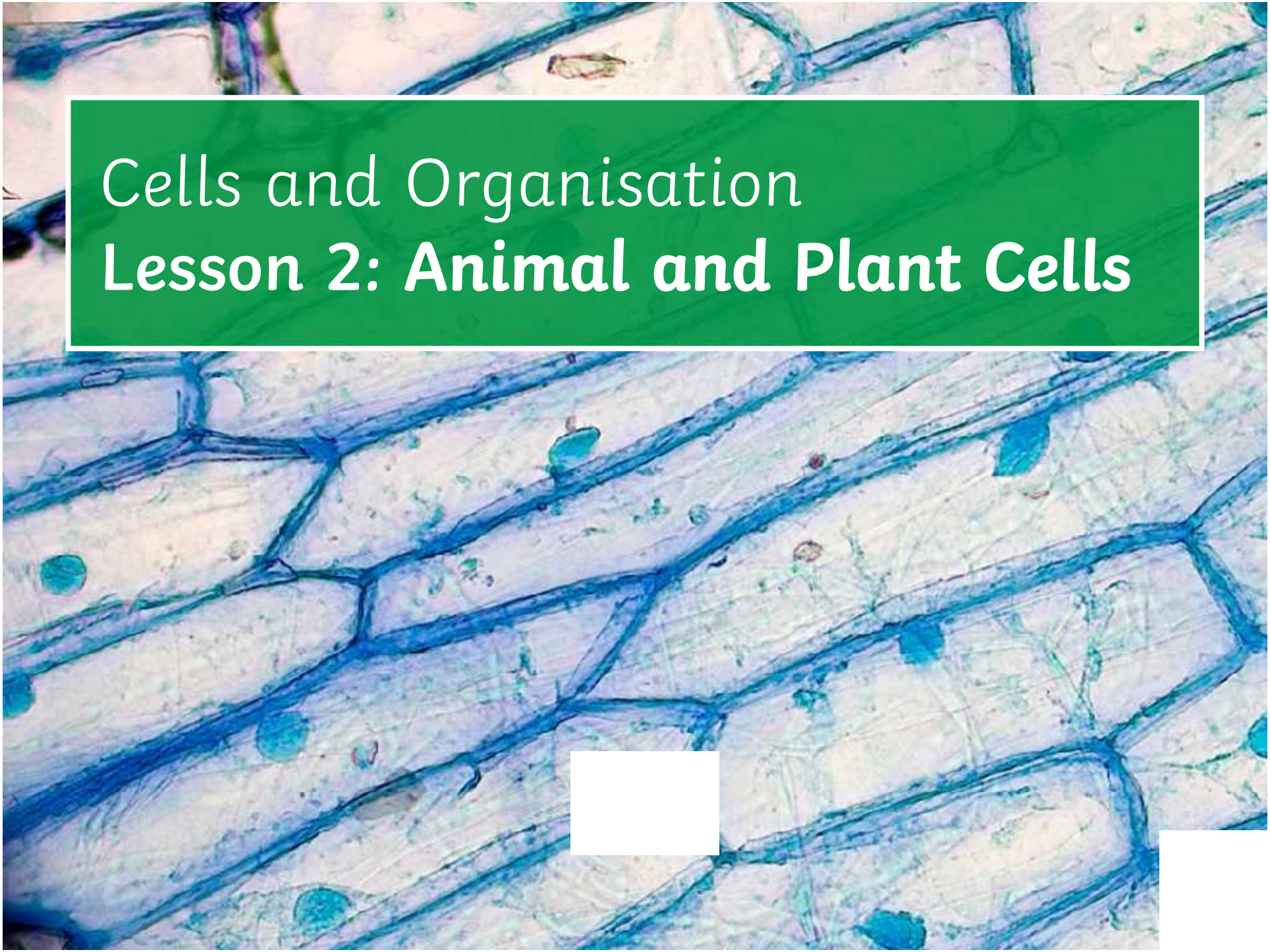
_____

_____

_____

_____

Signed: **Dated:**



Cells and Organisation
Lesson 2: Animal and Plant Cells

Starter

What would the world be like without any cells?

Learning Objective

- To understand the differences between plant and animal cells.

Success Criteria

- To correctly identify parts of a cell.
- To recall the roles (functions) of each part of a cell.
- To compare and contrast animal and plant cells.

Cells: Key Points

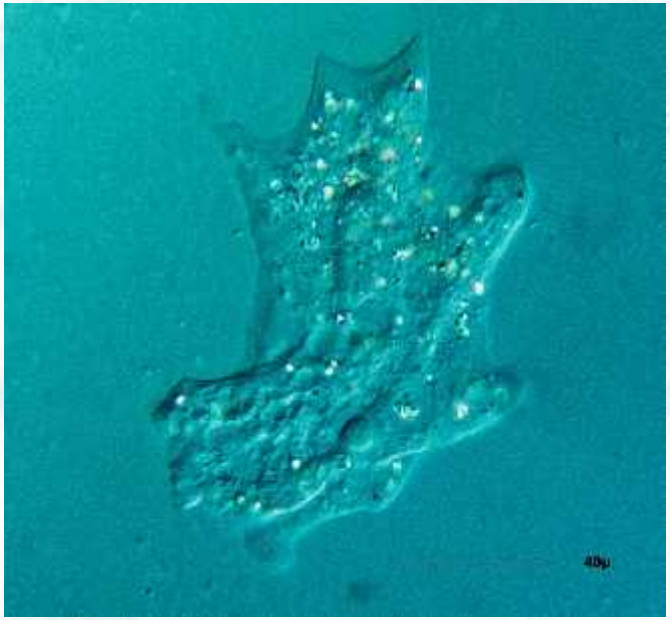
- Cells are the building blocks of life.

- They were named by Robert Hooke as he thought they looked like the tiny rooms that monks lived in.

Cells: Key Points

- Some organisms can live alone as just one cell.

- Some organisms, like humans, daffodils and dogs are made up of many different types of cells.

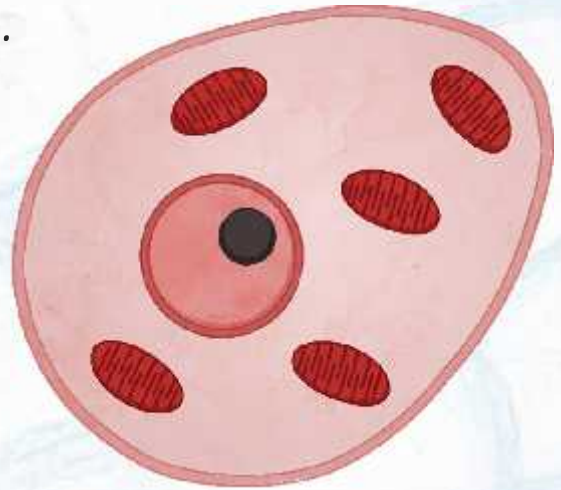


This is an amoeba, an example of a single-celled organism.

Inside Animal Cells

Most animal cells have some key features inside of them:

- A place where the cell's activities are controlled.
- A place where chemical reactions happen.
- A place where substances can pass in and out of the cell.
- A place where energy is released for the cell.



Inside Animal Cells

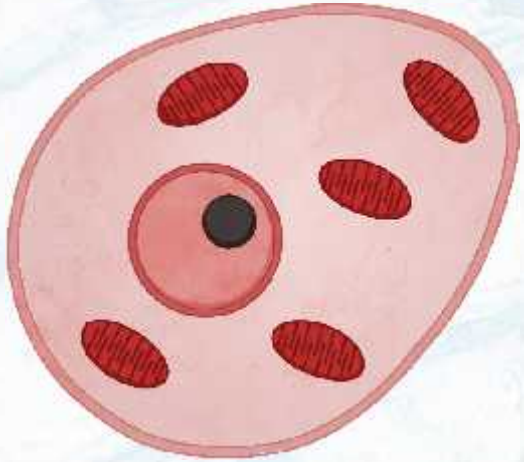
Look at the image, can you guess in pairs where each of these are?

A. A place where the cell's activities are controlled.

B. A place where chemical reactions happen.

C. A place where substances can pass in and out of the cell.

D. A place where energy is released for the cell.



Inside Animal Cells

Look at the image, can you guess in pairs where each of these are?

A. A place where the cell's activities are controlled.

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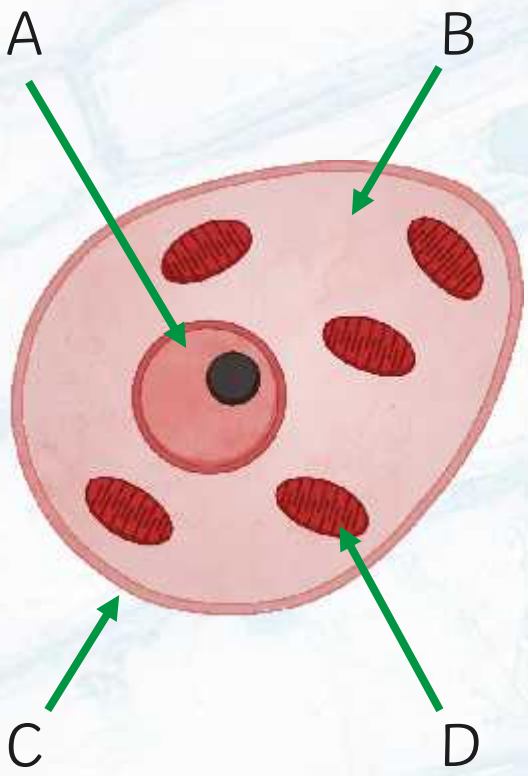


Animal Cell Activity

On a new page in your book, use a pencil to neatly draw a large animal cell like you have just seen.

See if you can remember the description of each part!

Challenge: These are the scientific names of each part, can you guess which description they match up with?

- nucleus
- cell membrane
- cytoplasm
- mitochondria

Sub-Cellular Structure Definitions

nucleus: Controls the activities of the cell. Contains genetic material (DNA), which is packaged into structures called chromosomes.

cell membrane: Controls the movement of substances into and out of the cell.

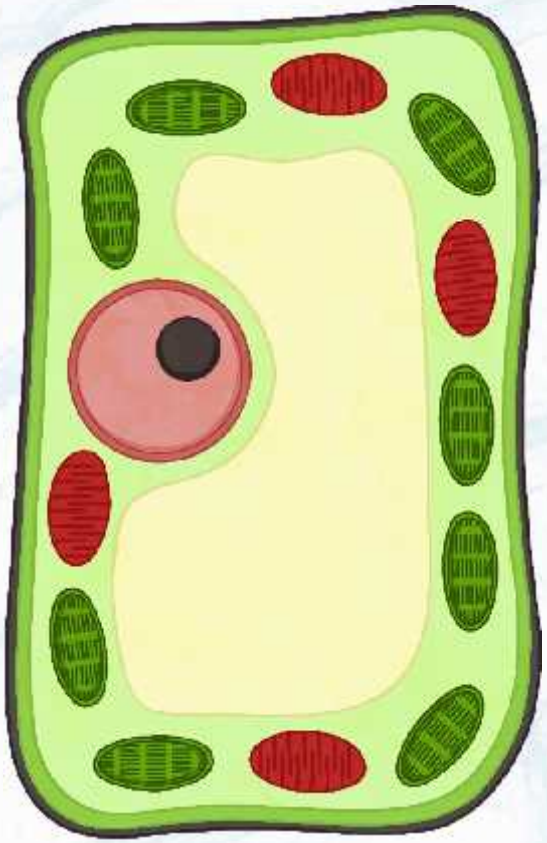
cytoplasm: A jelly-like substance that fills the cell, where most chemical reactions happen.

mitochondria: Contains the enzymes needed for aerobic respiration, which releases energy for the cell.

Take Notes
Make sure these are written down correctly and check your spelling.

Inside Plant Cells

Pause for Thought
What do you recognise in this plant cell?

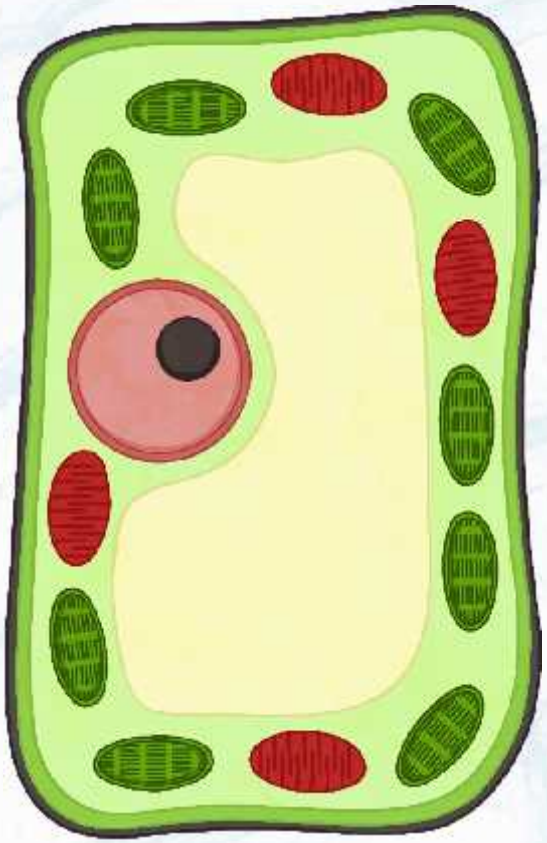


Inside Plant Cells

Most plant cells have the same **four** features inside of them as animal cells.

They also have **three** extra features:

- A place where light is captured for photosynthesis.
- A place where cell sap is stored.
- A place to help support and strengthen the cell.

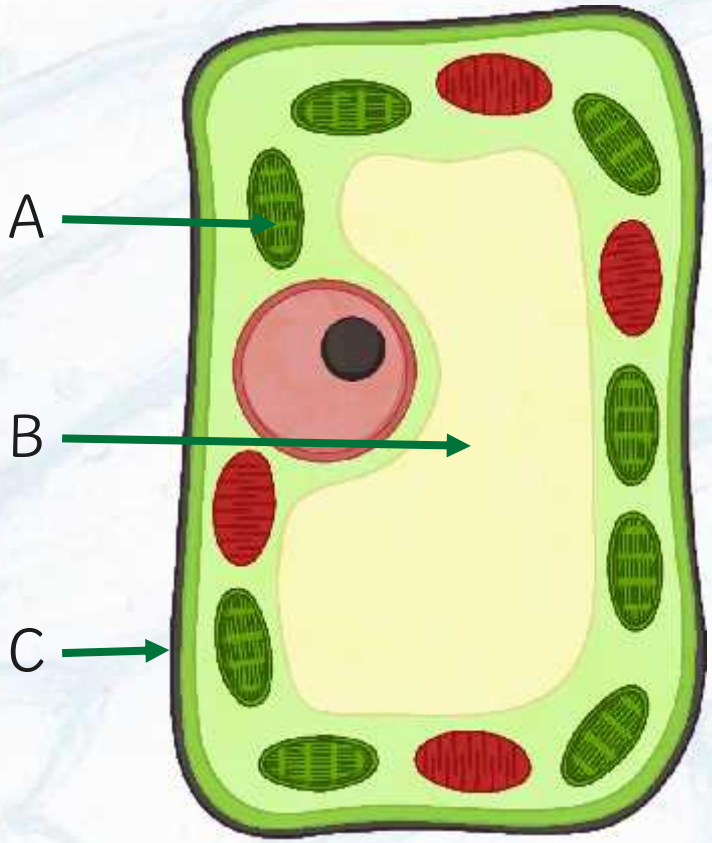


Inside Plant Cells

A. A place where light is captured for photosynthesis.

B. A place where cell sap is stored.

C. A place to help support and strengthen the cell.



Plant Cell Activity

On the next page in your book, use a pencil to neatly draw a large plant cell like you have just seen.

See if you can remember the description of each part!

Challenge: These are the scientific names of each part, can you guess which description they match up with?

- chloroplasts
- cell wall
- permanent vacuole

Sub-Cellular Structure Definitions

chloroplasts: Contain the pigment chlorophyll which absorbs light to provide energy for photosynthesis.

cell wall: A rigid structure that helps to strengthen the cell and provides support for the plant

permanent vacuole: Filled with cell sap to keep the cell rigid to support the plant.

Take Notes
Make sure these are written down correctly and check your spelling.

What Am I?

1. I am where chemical reactions happen in the cell.	2. I give strength and support to the cell.
3. I am where light is captured for photosynthesis.	4. I am where cell sap is stored in the cell.
5. I am where energy is released for the cell.	6. I am where substances can pass in and out of the cell.

Challenge 1: Which part of a cell is missing from the six descriptions above?

Challenge 2: Place a star next to your answers that are **only** found in plant cells.

What Am I?

1. cytoplasm	2. cell wall *
3. chloroplasts *	4. permanent vacuole *
5. mitochondria	6. cell membrane

Challenge 1: Which part of a cell is missing from the six descriptions above? **nucleus**

Challenge 2: Place a star next to your answers that are **only** found in plant cells.
cell wall, chloroplasts and vacuole

‘Lift Off’ Mini Plenary

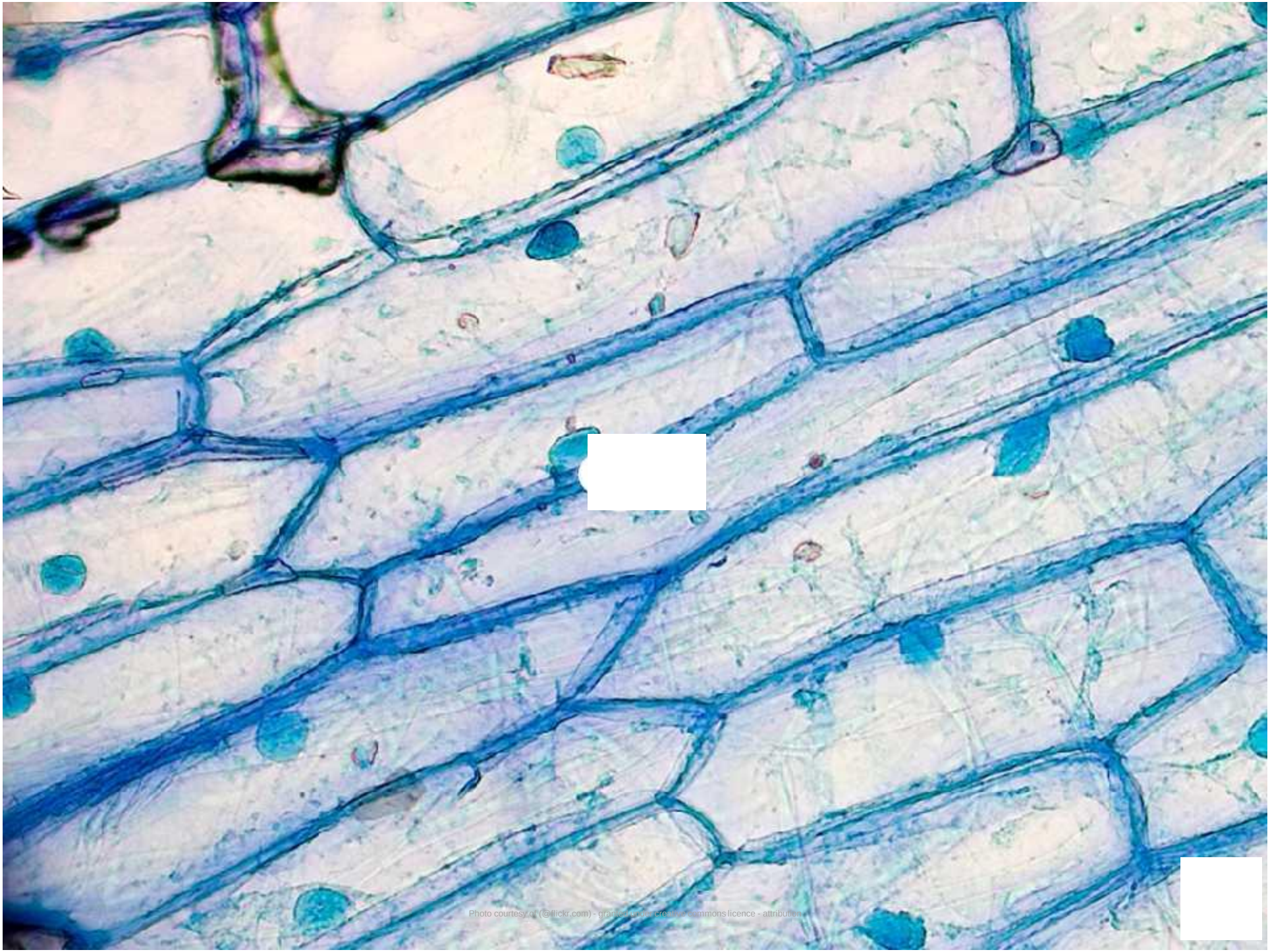
3 keywords

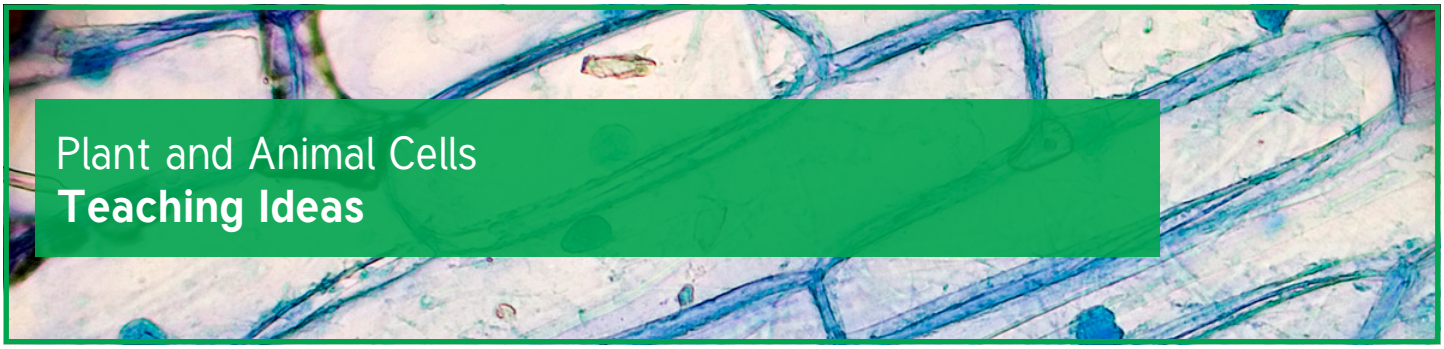
2 facts

1 question

What Did You Achieve Today?

- I can correctly identify parts of a cell.
- I can recall the roles (functions) of each part of a cell.
- I can compare and contrast animal and plant cells.





Plant and Animal Cells
Teaching Ideas

Learning Objective:	To understand the differences between plant and animal cells.
Success Criteria:	• To correctly identify parts of a cell. • To recall the roles (functions) of each part of a cell. • To compare and contrast animal and plant cells.
Context:	This is the first lesson of the new topic of 'Cells'.

Starter

As students enter the classroom and settle, on the beginning slide is a question 'What would the world be like without any cells?' This helps the teacher to gauge how many students are familiar with the term 'cells', what it means to them and can use the time to clarify any misconceptions. Ultimately no cells would mean no life!

Main Activities

Cells Key Points

Slides 3-4: Give background information to the students covering the basics.

Inside Animal Cells

Slides 5-9: Introduce four descriptions of parts of a cell on slide 5. Students are shown slide 6 and guess in pairs the location of each description. Answers are shown on slide 7. Students make notes and draw a basic animal cell using slide 8 as a prompt and extension question of linking keywords to descriptions. Answers and spelling check prompt are given on slide 9.

Inside Plant Cells

Slides 10-14: Show the plant cell on slide 10 and asks students to briefly compare to an animal cell, pointing out any features they already recognise. Describe the new extra parts of a plant cell using slides 11 - 12. Students make notes and draw a basic plant cell using slide 13 as a prompt and extension question of linking keywords to descriptions. Answers and spelling check prompt are given on slide 14.

What Am I? Mini Plenary

Slides 15-16: Students work in pairs to guess the part of a cell based on the description (six in total). Two extension questions are given on the same slide, asking which part of a cell has not been described and then to select parts only found in a plant cell and to write a '*' next to them in their answers.

Journey into a Cell

Students follow the to create their own guided tour around a plant or animal cell. Keywords given as a spellcheck aid, prompts given to assist students in starting the task and a student checklist to complete once finished to ensure work is of a good standard. On the second page of the worksheet is a peer assessment sheet, designed to be completed during the lesson. There is also a teacher assessment sheet that could be completed after the lesson.

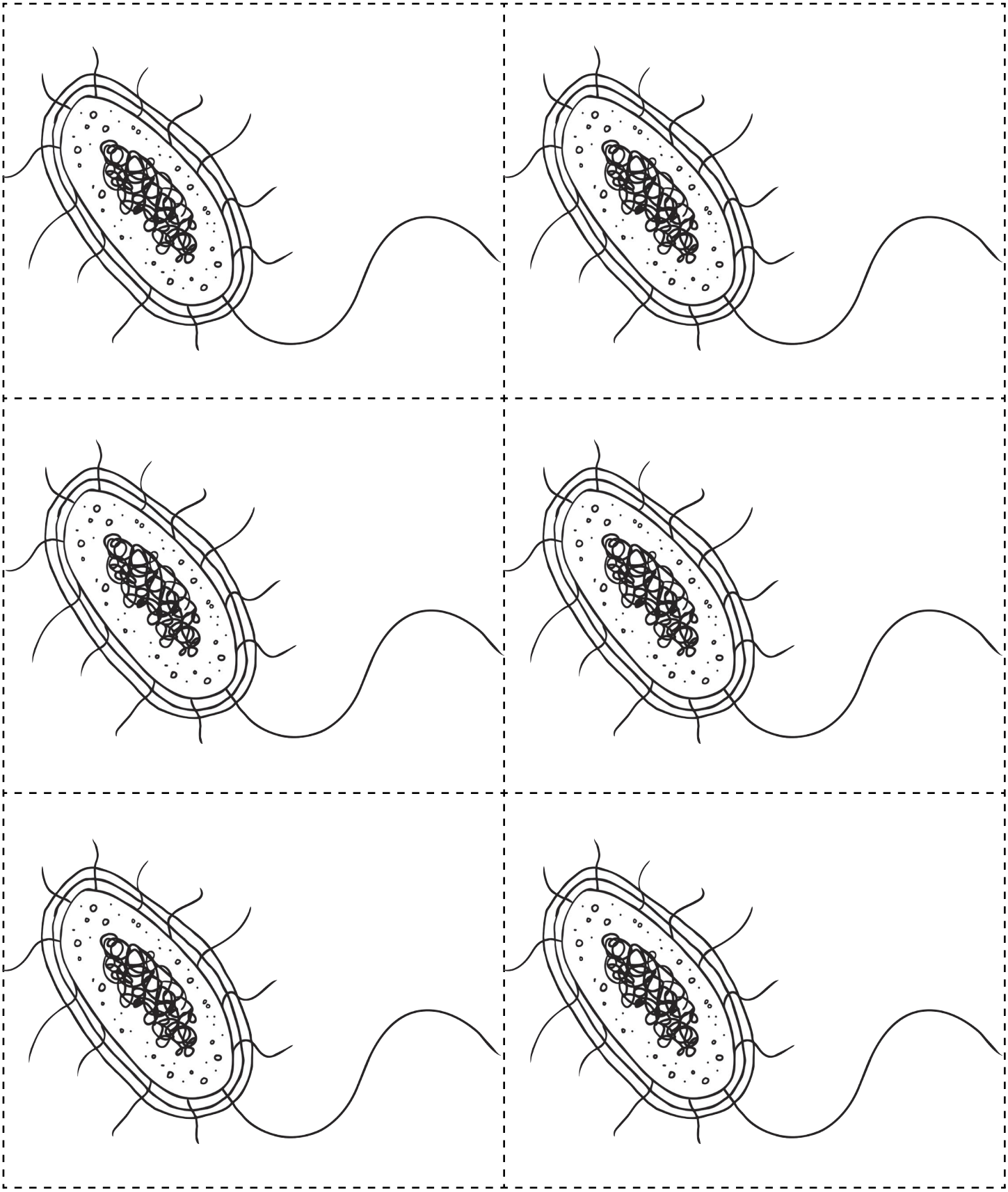
Plenary

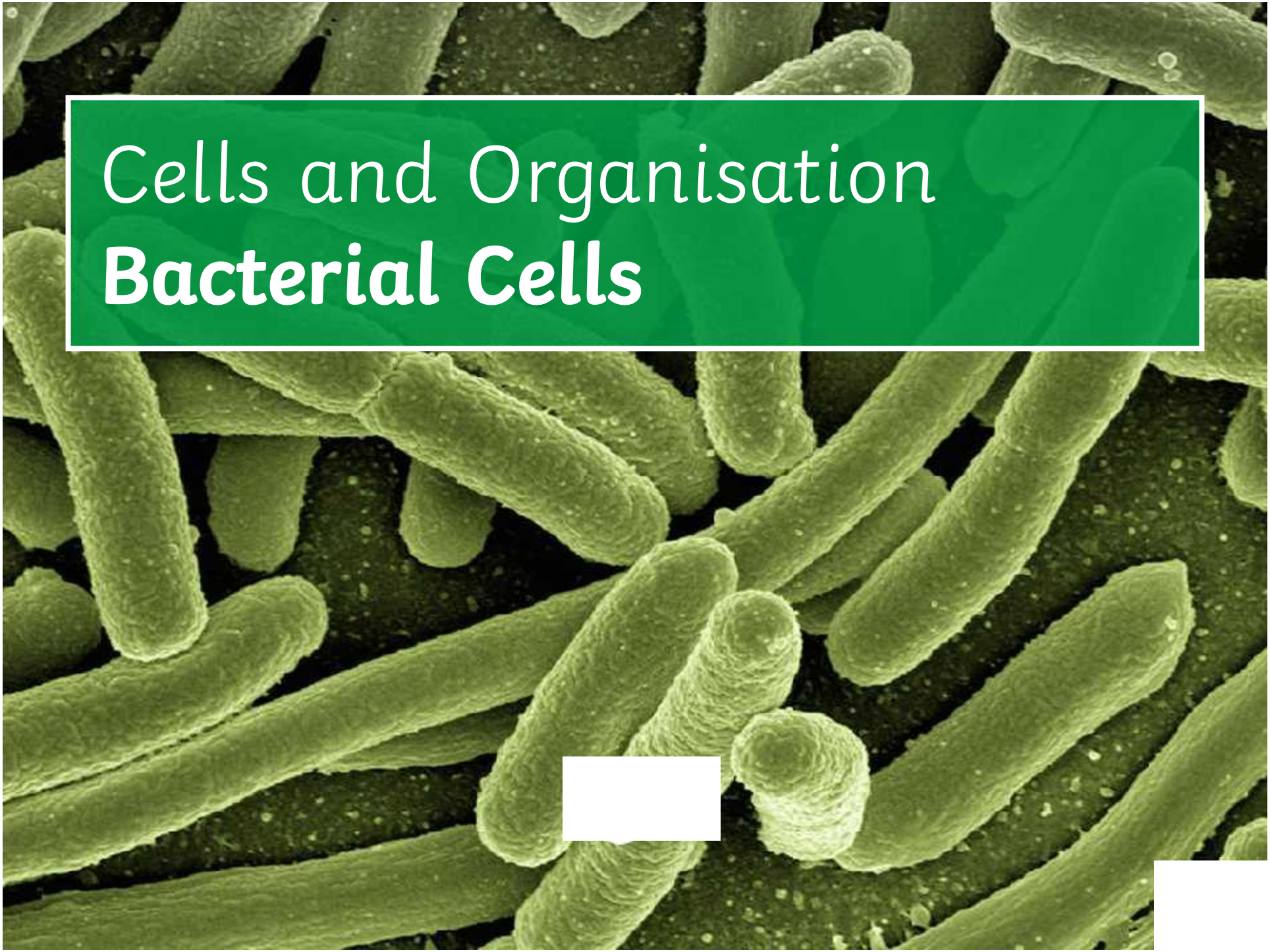
Students could either respond to their peer feedback or use the '3, 2, 1 Lift Off' mini plenary on slide 17 of the PowerPoint. Students write in their books three keywords, two facts they have learned today and one question about the topic they have. Remind the students of today's success criteria on slide 18 of the PowerPoint.

Suggested Home Learning

Students should learn the seven parts of a cell for a spelling test next lesson.

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

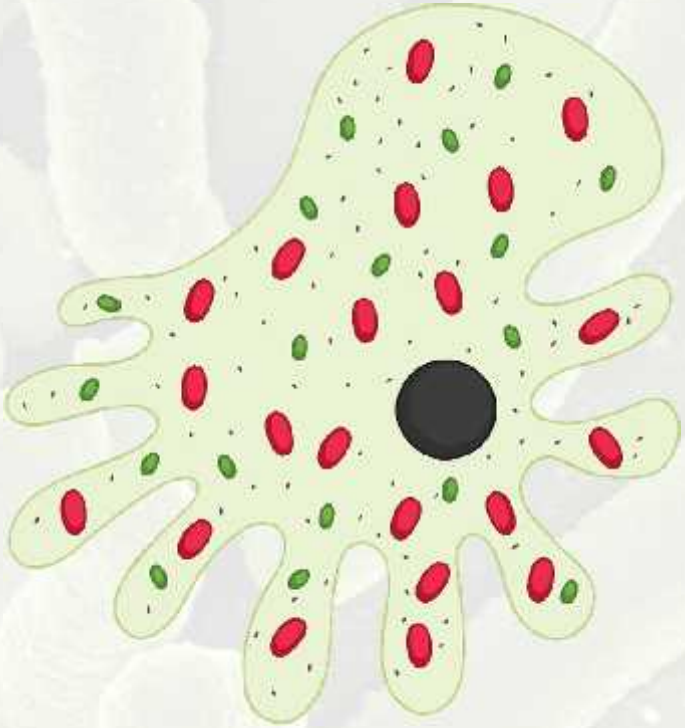
- To identify the organelles found in bacterial cells.
- To explain how bacterial cells are adapted to carry out specific functions.
- To compare bacterial, plant and animal cells and justify the differences between them.

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

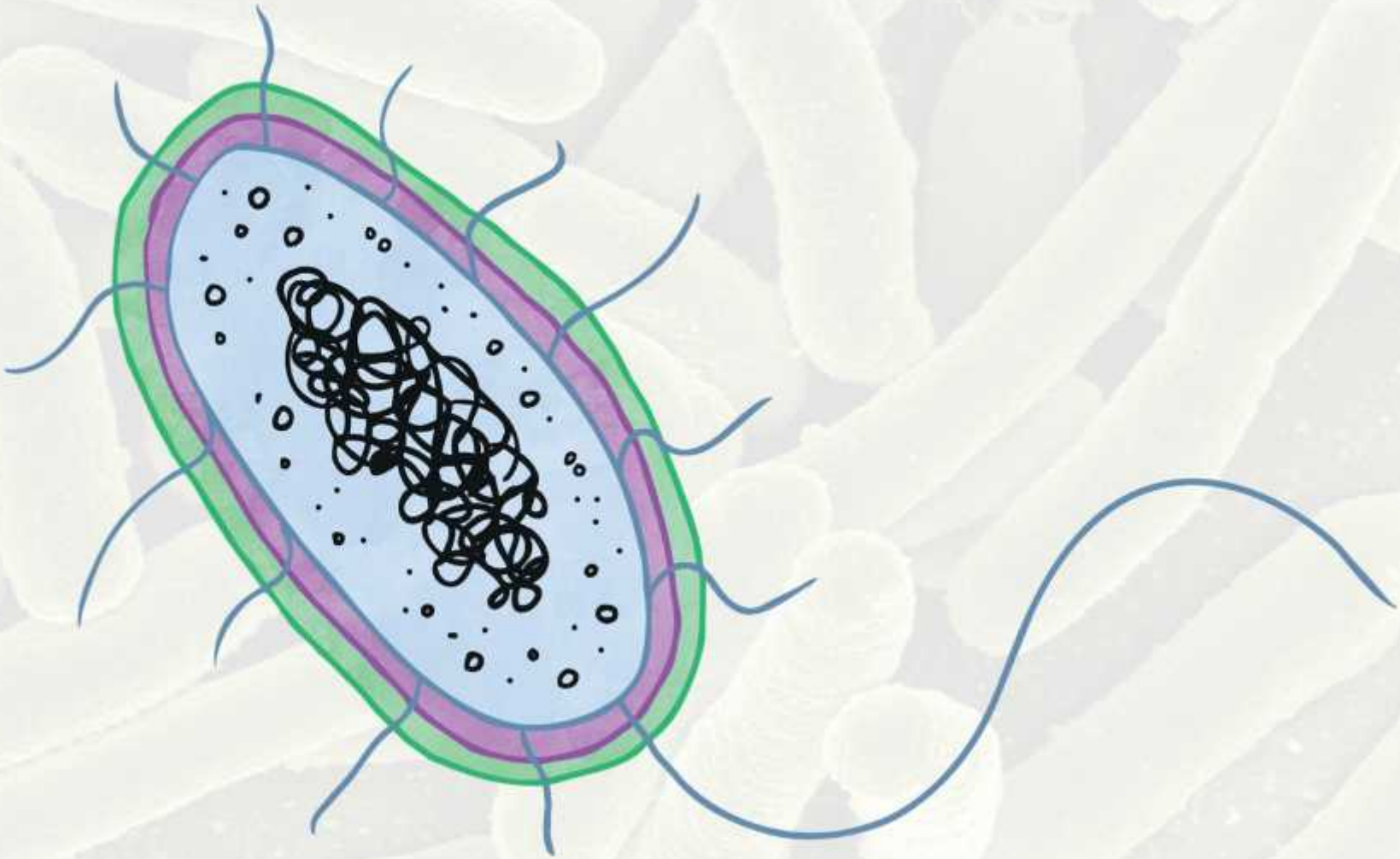
With a partner, turn your chairs so they are facing back-to-back.
Person 1 will have a diagram in front of them. They will be describing the diagram to person 2.

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

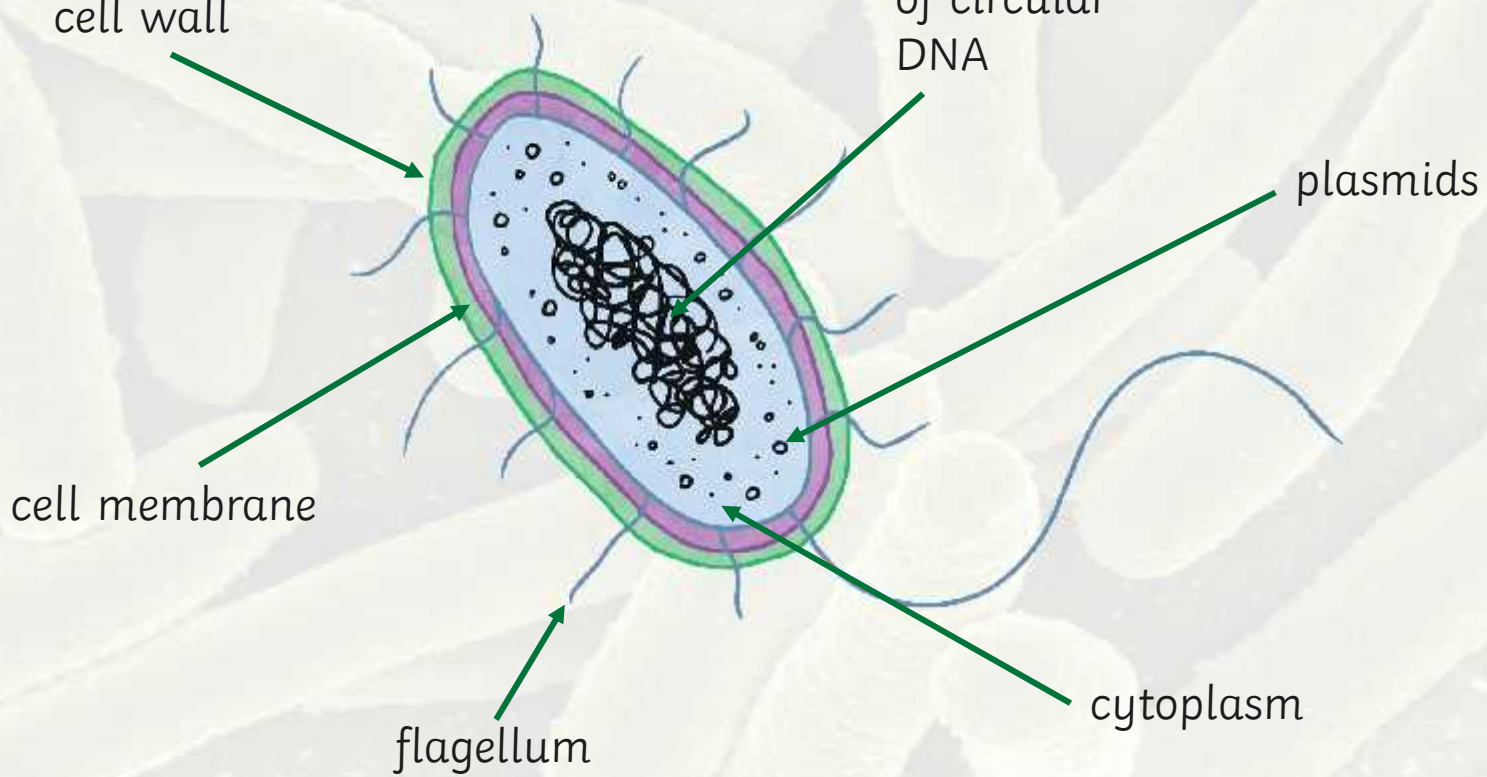
There must be no turning around. Person 2 must not see the diagram. Person 1 must not see the drawing.

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			✓

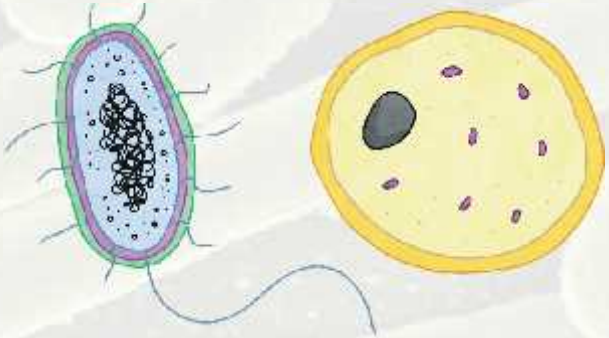
Keywords

unicellular

multicellular

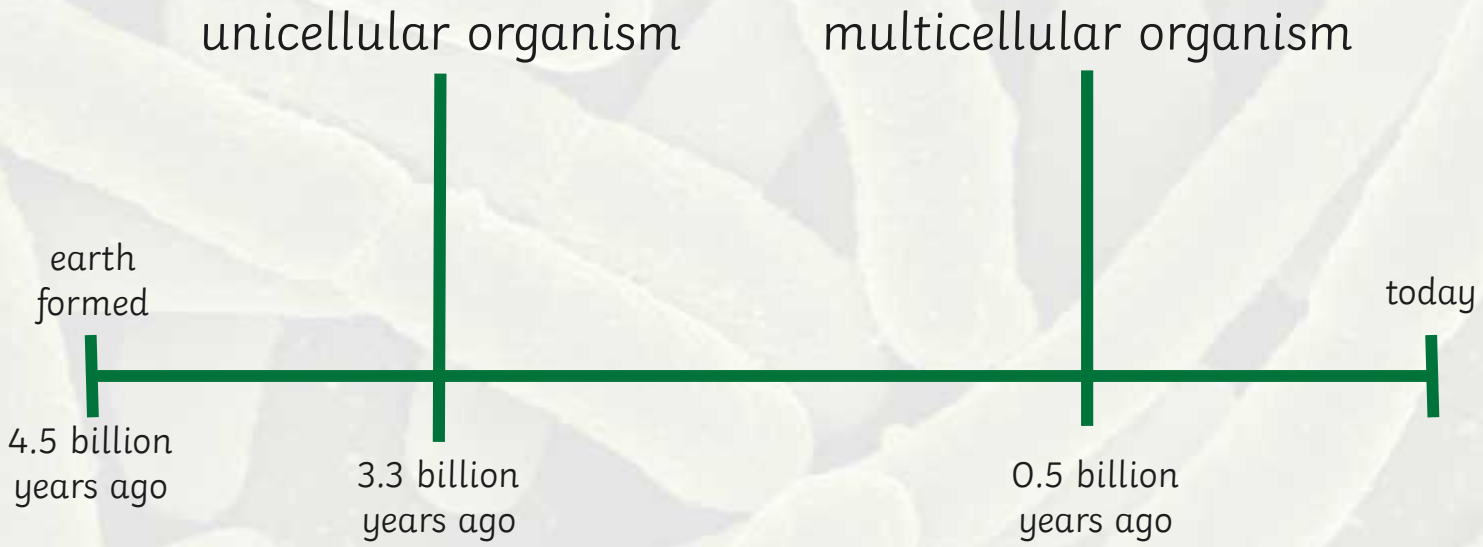
What do you think these words mean?

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.

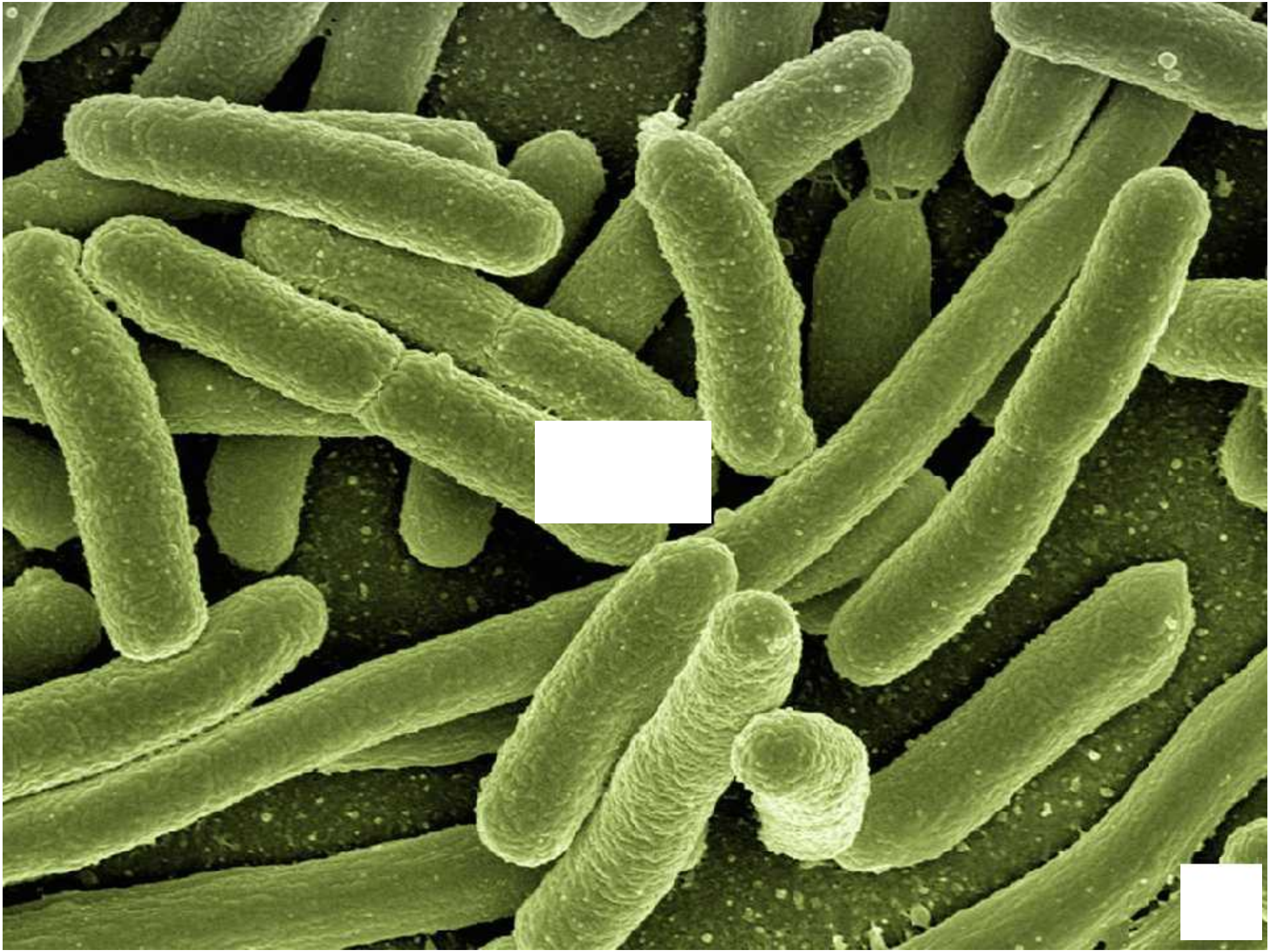
Draw cartoon versions of the organelles explaining what they do for a job.

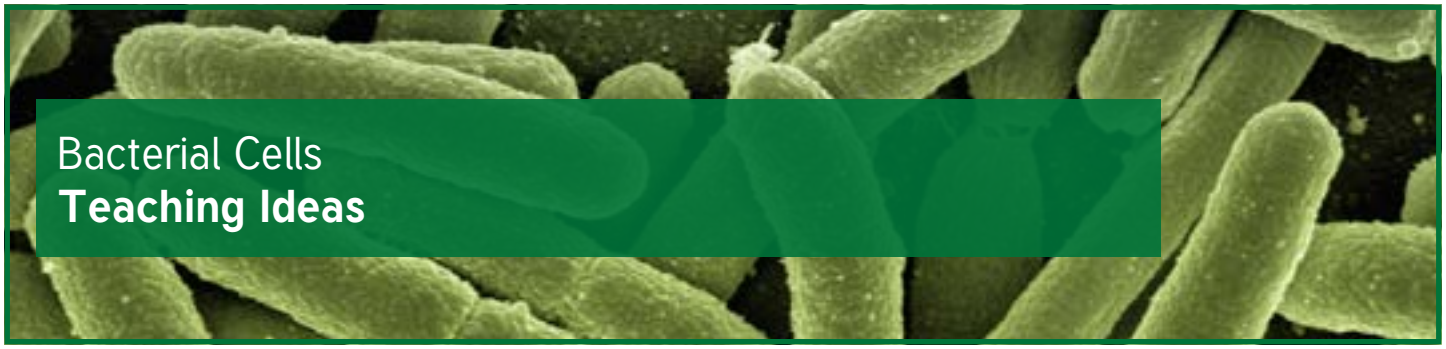
Make a glossary to pin up in your house.

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

Learning Objective:	To explain how unicellular organisms are adapted to carry out functions that in multicellular organisms, are done by different types of cell.	Resources **Lesson Pack** Optional: mini whiteboards and pens.
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.	
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.

Cells and Organisation Unit Overview KS3

About This Unit

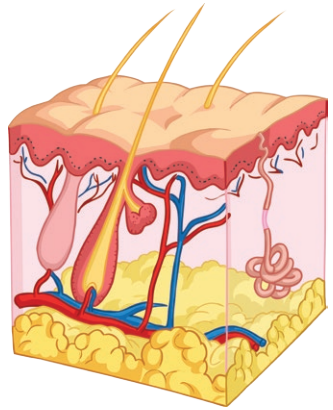
This unit aims to give KS3 students an overview of the organisation of living things from single cells through to organ systems. They will start to look at how the structural differences between types of cells allows them to perform specific functions within the organism. They will explore how the skeletal and muscular systems work together to cause movement.

Notes

There is a _____ that goes with this unit which lays out differentiated activities linked to each topic.

Lessons

Core Practicals Included



Lesson 1: How to Use a Microscope

Included in this Pack

Learning Objectives

To explore the importance of biological sciences and be able to use a microscope to magnify objects, to see in more detail.

Topics Covered

Using a light microscope.

Main Pupil Activities

Microscopes – Discuss the importance of the microscope and how it has led to scientific discoveries. Label parts of the microscope.

Using the Microscope to Observe Objects – Pupils look at objects and pre-prepared slides through their microscope and record what they observe on the activity sheet.

National Curriculum Aims

- Use a light microscope to observe and draw cells.
- Explain how to use a microscope to identify and compare different types of cells.

Resources

Lesson Pack

microscopes

pre-prepared slides

Objects to view through the microscope.

Health and Safety

Pre-prepared glass slides can cause cuts if broken. Model correct handling and storage of slides. Ensure floor is clear of obstacles. Remind students of fragility of glass slide. Dispose of any broken glass in glass bin and sweep surface clear.

Included in this Pack	Learning Objectives	Topics Covered	Main Pupil Activities
Animal and Plant Cells PowerPoint Teaching Ideas Animal and Plant Cells Activity Sheet	To understand the differences between plant and animal cells.	Structure of plant and animal cells. Function of organelles in plant and animal cells.	Inside Cells – Students link descriptions of the main parts of the animal and plant cells to their location in the cell. They record the structure of both cells with a diagram and descriptions. Journey into a Cell – Students follow the Journey into a Cell Activity Sheet to create their own guided tour around a plant or animal cell.
	National Curriculum Aims	**Resources**	
	• Both plant and animal cells have a cell membrane, nucleus, cytoplasm and mitochondria. Plant cells also have a cell wall, chloroplasts and usually a permanent vacuole.	Lesson Pack	

Included in this Pack	Learning Objectives	Topics Covered	Main Pupil Activities
Bacterial Cells PowerPoint Teaching Ideas Bacterial Cell Diagram Bacterial Cells Activity Sheet Bacterial Cells Activity Sheet – Lower Ability Bacterial Cells Extended Writing Mark Scheme	To explain how unicellular organisms are adapted to carry out functions that in multicellular organisms, are done by different types of cell.	Structure and adaptations of bacterial cells. Comparison of bacterial, animal and plant cell.	An Alien Cell – A chance to recap the structure of plant and animal cells. I See, You Draw – A fun activity to introduce the structure of a bacterial cell, where one student describes the cell and the other must draw based on their description. Extended writing – An activity to develop extended writing skills by asking students to compare plant, bacterial and animal cells.
Differentiation	**National Curriculum Aims**	**Resources**	
A lower ability version of the Bacterial Cells Activity Sheet provides sentence starters to help students structure their extended writing.	• Explain how unicellular organisms are adapted to carry out their functions that in a multicellular organism are done by different types of cell.	Lesson Pack optional: mini-whiteboards and pens	

Included in this Pack

Specialised Cells PowerPoint

Teaching Ideas

Cell Parts Can You Guess Cards

Specialised Cell Adaptations Activity Sheet

Specialised Cell Adaptations Activity Sheet Answers

Specialised Cell Adaptations Information Sheet

Specialised Cells Homework Activity Sheet

Differentiation

Sentence starters for extended writing are available on the Specialised Cells PowerPoint if required.

Learning Objectives

To explain how cells are adapted for their functions.

National Curriculum Aims

- There are many types of cell. Each has a different structure or feature, so it can do a specific job.
- Suggest what kind of tissue or organism a cell is part of, based on its features.
- Deduce general patterns about how the structure of different cells is related to their function.

Topics Covered

Specialised cells structure and function.

Resources

Lesson Pack

optional: sticky tack

Main Pupil Activities

Specialised Cells Treasure Hunt – Students search for information on the specialised cells that are hidden around the room and match it to the correct cells on their Specialised Cell Adaptations Activity Sheet.

Extended Writing – Students turn their collected facts into some extended writing about a specialised plant and animal cell.

Design a Specialised Cell – Students design a cell to do a specialised role in the body and can follow this up with research for homework to see how close their designs are to the real thing.

Included in this Pack

Levels of Organisation PowerPoint

Teaching Ideas

Levels of Organisation Activity Sheet

Levels of Organisation Activity Sheet Lower Ability

Organ Picture Cards

Differentiation

There is a lower ability version of the Levels of Organisation Activity Sheet which provides cloze statements to support students when writing keyword definitions. The sheet also provides a way to represent a hierarchy.

Organ Picture Cards can be used to help students recognise new organs.

Learning Objectives

To explain the hierarchy of organisation in a multicellular organism.

National Curriculum Aims

- Multicellular organisms are composed of cells which are organised into tissues, organs and systems to carry out life processes.

Topics Covered

The function of six organ systems.

The hierarchy of organisation.

Resources

Lesson Pack

optional: sticky tack

Main Pupil Activities

A Closer Look at Organs – These slides take the students through the six organ systems on the KS3 syllabus and identify an organ, tissue and cell from that system. The new information is recorded on the Levels of Organisation Activity Sheet.

Where Do These Organs Belong? – Students match other organs to the correct organ systems.

Hierarchy of Organisation – Students are provided with differentiated support to produce a hierarchy of organisation for the keywords in this lesson.

Lesson 6: The Skeleton

Included in this Pack

Skeleton PowerPoint
Teaching Ideas
Organ System Function Cards
Skeleton Activity Sheet
Skeleton Relay Diagram

Learning Objectives

To explain the role of the skeleton in the human body.

Topics Covered

The role of the skeleton and joints.

Main Pupil Activities

Skeleton Relay – This is a fun activity designed to get students learning the names of key bones by working as a group to reproduce a diagram of the skeleton from memory.

Skeleton Function – The students are given cards with functions of various organ systems on. They match these to the correct organ system to help them identify the roles that the skeleton plays and recap systems from the previous lesson.

Joints – Students use modelling clay to make simple versions of ball and socket and hinge joints.

Differentiation

There is a lower ability version of the Skeleton Activity Sheet which has keyword prompts to support students with writing scientific descriptions.

National Curriculum Aims

- The parts of the human skeleton work as a system for support, protection, movement and the production of new blood cells.
- Explain how a physical property of part of the skeleton relates to its function.

Resources

optional:
modelling clay
cocktail sticks
sticky notes

Included in this Pack

Muscles PowerPoint
Muscles Video
Teaching Ideas
Dissection Instruction Sheet
Muscles Activity Sheet

Learning Objectives

To explain how muscles interact with different tissues in the body to cause movement.

Topics Covered

Antagonistic muscle pairs.

Main Pupil Activities

Dissection – Students are guided through a chicken wing dissection that allows them to identify the main structures and model how antagonistic muscles work in pairs.

Muscles Activity Sheet – Students describe the look and feel of the tissues and record the role that each plays. They then explain why muscles need to work in pairs.

Differentiation

The lower ability version of the Muscles Activity Sheet lists the functions of each tissue type for students to match to the correct tissue and provides a cloze statement to help them explain how antagonistic muscle pairs work.

National Curriculum Aims

- Antagonistic pairs of muscles create movement when one contracts, and the other relaxes.
- Explain why some muscles contain muscle tissue.
- Explain how antagonistic muscles produce movement around a joint.
- Use a diagram to predict the result of a muscle contraction or relaxation.

Resources

Lesson Pack
chicken wings
dissection scissors
dissecting board or tray
bin bags
disinfectant in bucket/tub
disinfectant hand wash
optional:
gloves
aprons

Health and Safety

Please check the rules regarding carrying out this kind of experiment in your own learning environment. There is a risk that raw chicken is carrying salmonella, so do ensure that students are carrying out the dissection away from their work and personal belongings. Students should be reminded not to touch their face during the practical and disinfectant hand wash should be provided for hand washing before students return to their personal equipment. Benches should be wiped down with disinfectant after use.

Dissection tools could cause cuts. Model correct use and storage of dissection tools. Show students how to cut away from their body and other people. Ensure the floor is free of obstacles.

Levels of Organisation

1. Use the presentation to complete the boxes with the correct organ system, and examples of a tissue and cell type associated with each organ.

Organ System	Organ	Tissue	Cell
	heart		
	lungs		
	ovaries		
	testes		
	small intestine		
	muscles		
	skin		

2. Write a definition for each of the following terms:

Cell: _____

_____

Tissue: _____

_____

Organ: _____

_____

Organ System: _____

_____

3. What does each organ system do?

Organ System	Function

4. A hierarchy is a way to arrange things due to their relative importance. Can you produce a diagram that represents the hierarchy of the different levels of organisation?

Levels of Organisation Answers

1. Use the presentation to complete the boxes with the correct organ system, and examples of a tissue and cell type associated with each organ.

Organ System	**Organ**	**Tissue**	**Cell**
circulatory system	heart	blood vessel	red blood cell
respiratory system	lungs	ciliated epithelium	ciliated epithelium cell
reproductive system	ovaries	ovarian follicles	ovum (egg cell)
reproductive system	testes	germinal epithelium	sperm cell
digestive system	small intestine	ciliated epithelium	ciliated epithelium cell
muscular skeletal system	muscles	skeletal muscle tissue	muscle cell
immune system	skin	epidermis	skin cell

2.

Cell: The unit of a living organism, contains parts to carry out life processes.

Tissue: Group of cells of one type.

Organ: Group of different tissues working together to carry out a job.

Organ System: Group of different organs working together to carry out a job.

3.

Organ System	**Function**
muscular skeletal system	Muscles and bones working together to cause movement and support the body.
reproductive system	Produces eggs and sperm, and is where the foetus develops.
respiratory system	Replaces oxygen and removes carbon dioxide from blood.
immune system	Protects the body against infections.
digestive system	Breaks down and then absorbs food molecules.
circulatory system	Transports substances around the body.

4. Any diagram that shows the correct arrangement of terms: organism, organ system, organ, tissue, and cell is okay.

Levels of Organisation

1. Use the presentation to complete the boxes with the correct organ system, and examples of a tissue and cell type associated with each organ.

Organ System	Organ	Tissue	Cell
	heart		
	lungs		
	ovaries		
	testes		
	small intestine		
	muscles		
	skin		

2. Can you put the keywords **cell**, **tissue**, **organ** and **organ system** next to the correct definition in the list below?

The unit of a living organism, contains parts to carry out life processes. _____

Group of cells of one type. _____

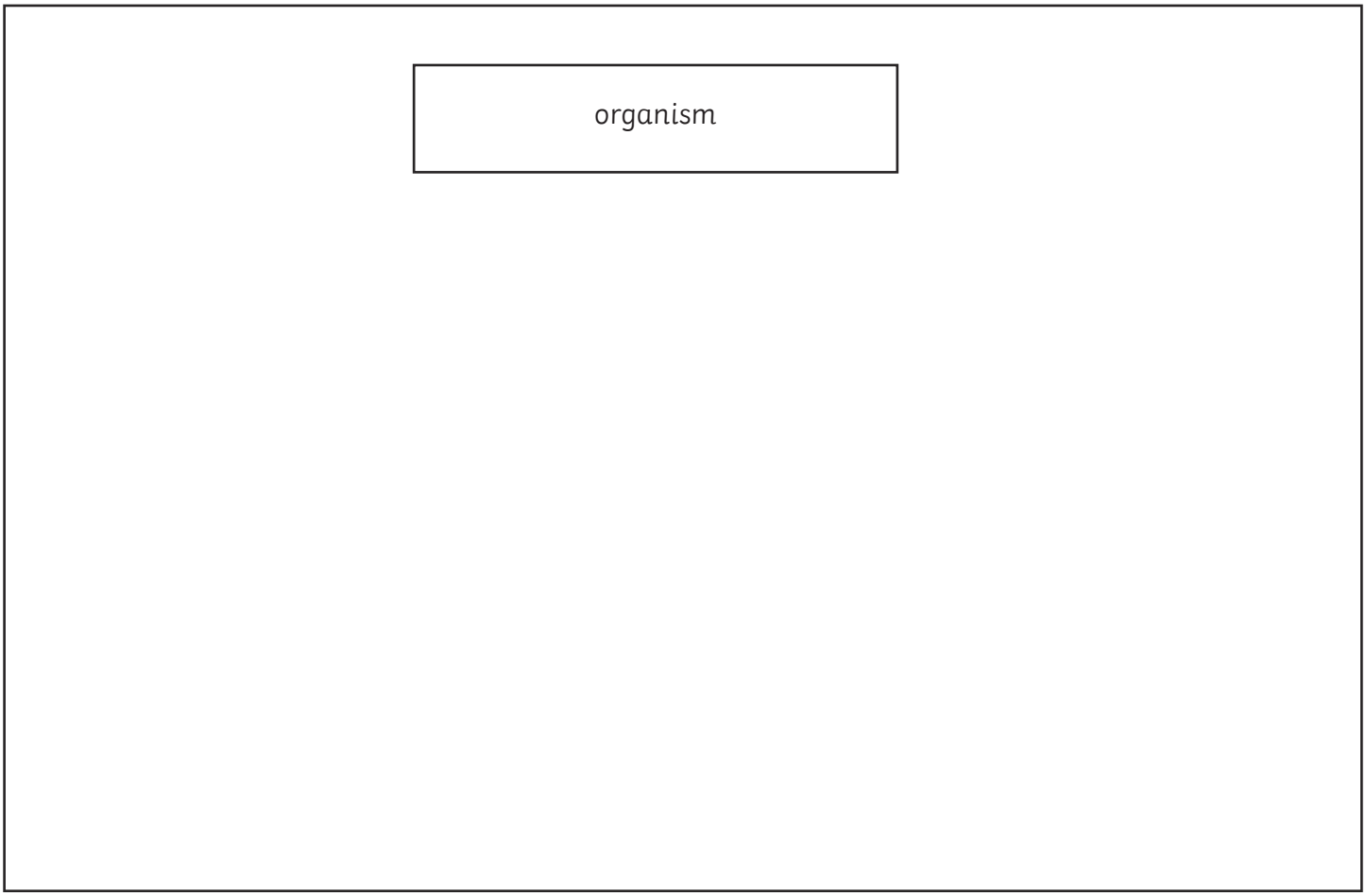
Group of different tissues working together to carry out a job. _____

Group of different organs working together to carry our a job. _____

3. Can you fill the gaps to describe the function of each organ system?

Organ System	Function
muscular skeletal system	Muscles and _____ working together to cause _____ and support the body.
reproductive system	Produces _____ and _____, and is where the foetus develops.
respiratory system	Replaces _____ and removes _____ _____ from blood.
immune system	Protects the body against _____.
digestive system	_____ down and then _____ food molecules.
circulatory system	_____ substances around the body.

4. A hierarchy is a way to arrange things due to their relative importance. Use the diagram below to arrange cell, organ system, tissue and organ into the correct order.



Levels of Organisation Answers

1. Use the presentation to complete the boxes with the correct organ system, and examples of a tissue and cell type associated with each organ.

Organ System	**Organ**	**Tissue**	**Cell**
circulatory system	heart	blood vessel	red blood cell
respiratory system	lungs	ciliated epithelium	ciliated epithelium cell
reproductive system	ovaries	ovarian follicles	ovum (egg cell)
reproductive system	testes	germinal epithelium	sperm cell
digestive system	small intestine	ciliated epithelium	ciliated epithelium cell
muscular skeletal system	muscles	skeletal muscle tissue	muscle cell
immune system	skin	epidermis	skin cell

2.

The unit of a living organism, contains parts to carry out life processes. **cell**

Group of different organs working together to carry out a job. **organ system**

Group of cells of one type. **tissue**

Group of different tissues working together to carry out a job. **organ**

3.

Organ System	**Function**
muscular skeletal system	Muscles and **bones** working together to cause **movement** and support the body.
reproductive system	Produces **eggs** and **sperm**, and is where the foetus develops.
respiratory system	Replaces **oxygen** and removes **carbon dioxide** from blood.
immune system	Protects the body against **infections**.
digestive system	**Breaks** down and then **absorbs** food molecules.
circulatory system	**Transports** substances around the body.

4. Any diagram that shows the correct arrangement of terms: organism, organ system, organ, tissue, and cell is okay.

Levels of Organisation
Teaching Ideas

Learning Objective:	To explain the hierarchy of organisation in a multicellular organism	Resources **Lesson Pack** optional: sticky tack
Success Criteria:	• To define and state examples of cells, tissues, organs and organ systems • To classify organs into the correct organ system • To produce a diagram to illustrate the hierarchy of organisation	
Context:	This lesson covers the six organ systems that are required at key stage 3, focusing on major organs in those systems, and introducing some tissues and specialised cells. The beginning of the presentation could also be used to put a specialised cells lesson into context. From key stage 2, students should know that muscles and skeleton provide support and movement, and they should be able to describe the functions of the digestive system and circulatory system.	

Starter

Share What You Know!

The starter slide asks the students to name any organs they are already aware of, and should provide the opportunity for you to assess prior knowledge with questioning. The activity could be done individually on paper, whiteboards, or in books; or in pairs or table groups.

The answer of 79 organs in the human body is one that depends on the way that organs are characterised and provides a good opportunity to link to HSW (How Science Works) and how scientists often challenge each other.

The facts about the largest and smallest organs provide an interesting hook – many students don't yet consider the skin as an organ.

Main Activities

A Closer Look at Organs

Slides 4-17 focus on an organ in each of the six organ systems on the key stage 3 syllabus. Clicking on the organ on slide 4 will take you to the corresponding information slide, which will identify a tissue and cell from that organ as if you were zooming in. Students can record these into the table on the **Levels of Organisation Activity Sheet**. The following slide asks students to identify the organ system to which that organ belongs, and record it in the tables. Click on the back button to be taken back to the overview to choose a different organ.

If you're presenting this activity as a whole class discussion, then there are lots of opportunities to question students about the largest and smallest of the cell, tissue, organ and organ system. You could also ask whether they can identify any other organs from that system, or tell you what the organ's function in the body is.

Alternatively, this could be an independent learning activity if you have access to a computer room or tablets for students to work through these slides independently.

Teacher note - for the skin (slide 17), you may wish to embellish on this more, explaining that the skin (for key stage 3) is part of the immune system, and that this also includes the lymphatic system - which may also lead to some extensive discussion.

Key Words

Slides 18 and 19 are differentiated versions of the key words slide. You can delete or hide as appropriate for your class.
On slide 18, higher ability students are asked to come up with definitions of the words cell, tissue, organ and organ system individually, given what they've seen on the information slides. There is space to record these on the **Levels of Organisation Activity Sheet**. This could then provide a good opportunity for peer assessment, if pairs work together to improve these definitions as you bring up the answer on a click.

Slide 19 gives students the definitions and asks them to write the terms cell, tissue, organ and organ system next to the correct one.

Organ System Functions

Slides 20-22 are differentiated versions of What Do Our Organs Do? You can delete or hide as appropriate for your class. On slide 20, higher ability students are asked to identify the function of each of the six organ systems and record these in the table on the **Levels of Organisation Activity Sheet**. Some students may benefit from sharing ideas in pairs or small groups to develop concise descriptions for each group. If students need additional support, you could ask them to work in groups initially to come up with some useful key words and share these as a class, before asking students to turn them into full sentences on their sheet.

For lower ability students, slide 21 gives them part of the definition for each organ system and asks them to fill in the blanks on their **Levels of Organisation Activity Sheet**.

Where Do These Organs Belong?

Slide 22 shows images of some different organs also mentioned in the syllabus. Students need to identify which organ systems these organs belong to. The **Organ Picture Cards** can be used here to help students sort into the correct systems. You could write the systems as headings across the board or sheets of paper around the room and ask students to stick the cards to the system they think is correct. Remind them that some might not be as simple as it seems! This could be done in table groups to reduce printing. Alternatively, you could use the cards as a card sort on the table.

The activity could be done without the **Organ Picture Cards** by asking students to write their answers on whiteboards to lift for you to assess the full class at once, or as a class discussion.

Questioning around this activity will allow you to assess if students have understood the function of each organ system. Ask students to justify their decision to assign each organ to that system; why it wouldn't belong in a different system; or if they think it might belong in any other systems, too. You may need to explain that the rings on the trachea picture are made of cartilage and not bone.

Hierarchy of Organisation

Slide 24 asks students to produce a diagram to represent the hierarchy of organisation for the key words in this lesson. They can complete this on the **Levels of Organisation Sheet.**

Plenary

Think, Pair, Share

Ask the students to decide independently which of the organs they've looked at today is the most important. After a minute, ask them to share this with their partner, and justify to each other why they think this is the best organ. Tell them that you will want to hear them talking about the role it plays in the body, the organ system it belongs to and why it is a better choice than their partner's organ.

Pick some students to share their arguments with the whole class, or ask people to volunteer their partners who had a good argument. Use questioning to push students to defend their decision based on what they know about the role of the organ and organ system, why we couldn't live without it, and what might happen if it stopped working. Ask other students to offer arguments against that organ, or to help to defend its role as the most important.

Homework

The lesson covers the six organ systems that are on the key stage 3 syllabus. Students could find out about one of the other five major systems in the body to extend their learning. You could take five minutes at the start of the next lesson to have some students share their research with the class, or alternatively ask them to represent what they have found out in a method of their choice.

Levels of Organisation

Learning Objective

- To explain the hierarchy of organisation in a multicellular organism.

Success Criteria

- To define and state examples of cells, tissues, organs and organ systems.
- To classify organs into the correct organ system.
- To produce a diagram to illustrate the hierarchy of organisation.

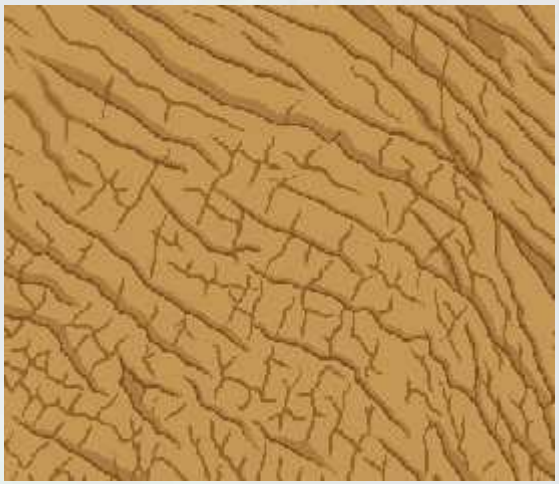
Share What You Know

How many organs in the human body can you name?

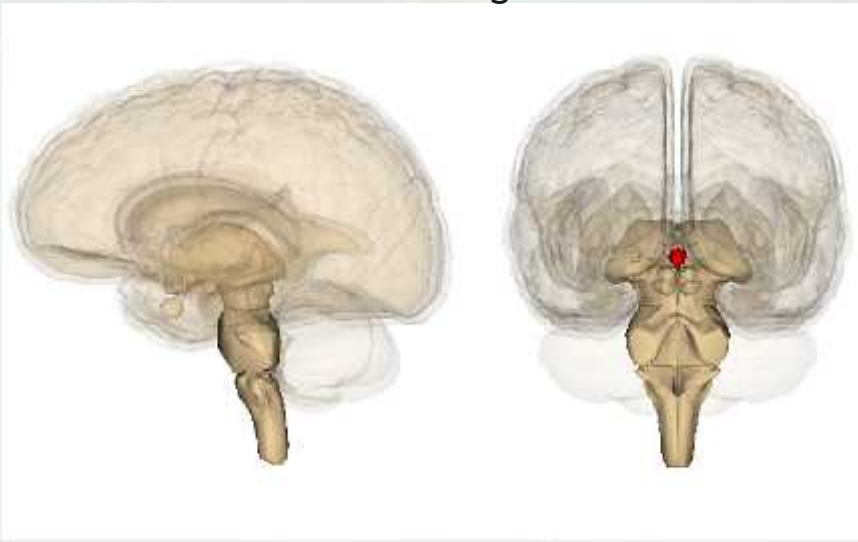
There are approximately 79 organs in the human body, but it's something that is debated - not all scientists agree on what counts as an organ!

Can you guess which is the largest? Or the smallest?

Skin

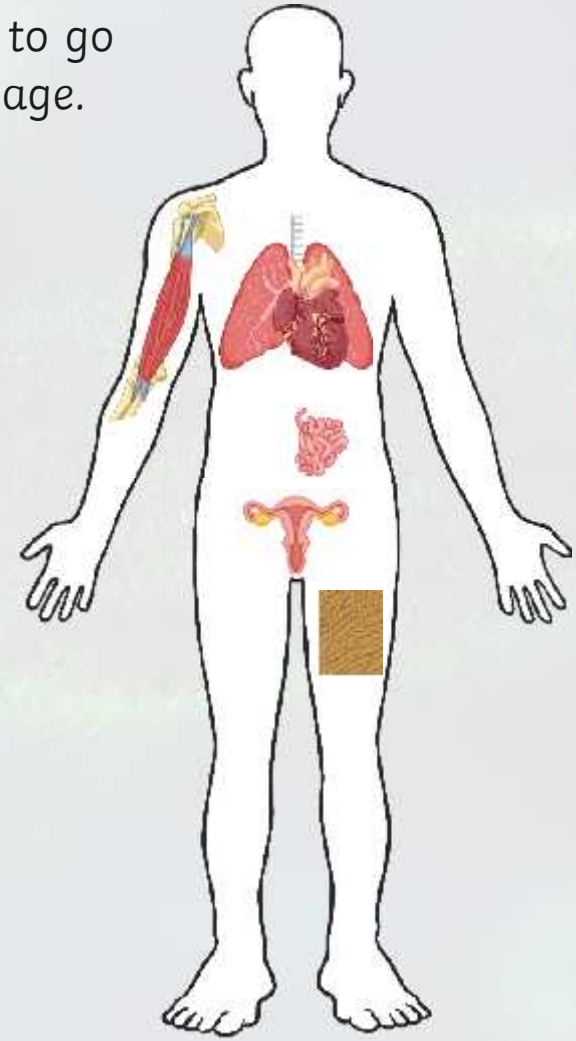


Pineal gland



A Closer Look at Organs

Please click on an organ to go directly to the relevant page.



The Heart

Organ
heart

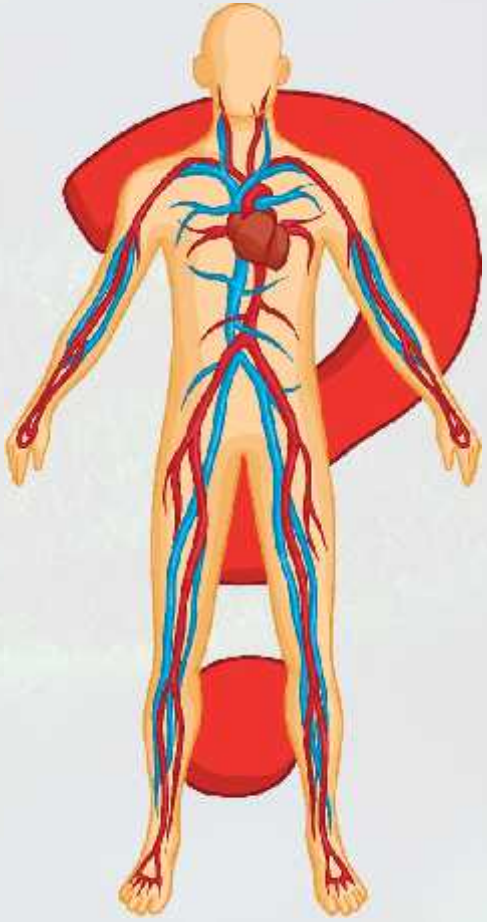
Example of a Tissue
blood vessel

Cell
red blood cell

Go to the next slide for more information

Which Organ System?

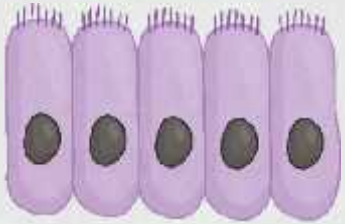
- muscular skeletal system ✗
- reproductive system ✗
- respiratory system ✗
- immune system ✗
- digestive system ✗
- circulatory system ✓



Click here to return to previous page

The Lungs

Organ
lungs



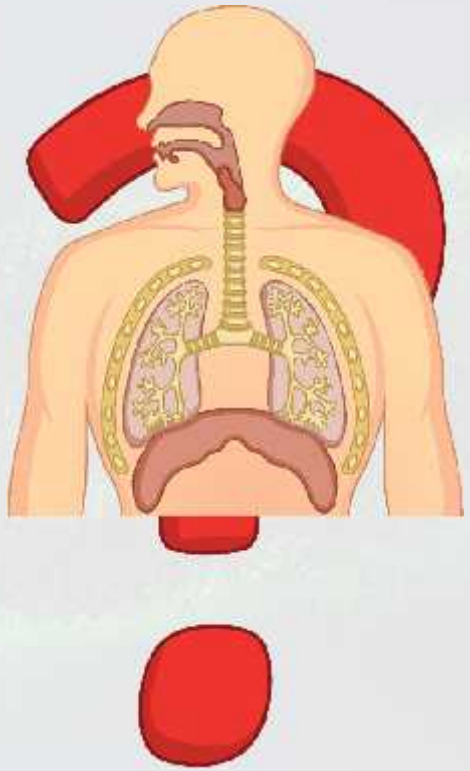
Example of a Tissue
ciliated epithelium

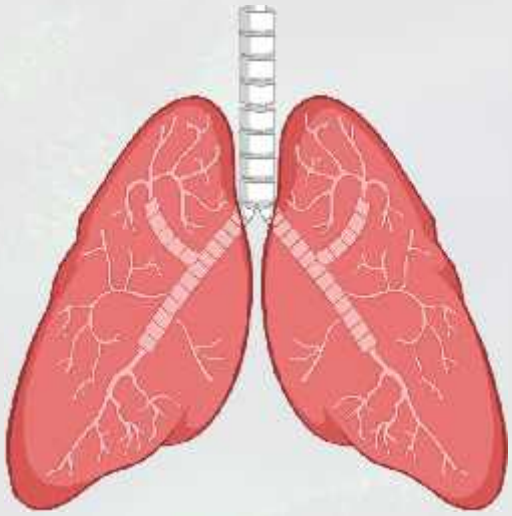
Cell
ciliated epithelium cell

Go to the next slide for more information

Which Organ System?

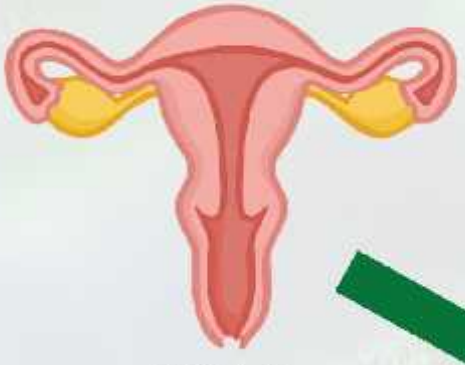
- muscular skeletal system ✗
- reproductive system ✗
- respiratory system ✓
- immune system ✗
- digestive system ✗
- circulatory system ✗



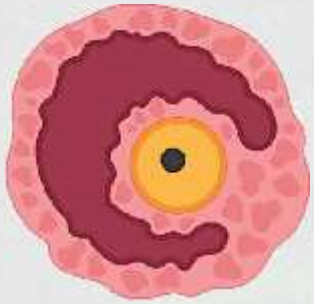


Click here to return to previous page

The Ovaries



Organ
ovaries



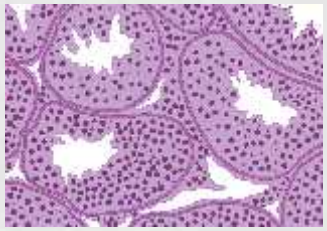
Example of a Tissue
ovarian follicle

Cell
ovum

Go to the next slide for more information

What About Males?

Organ
testes



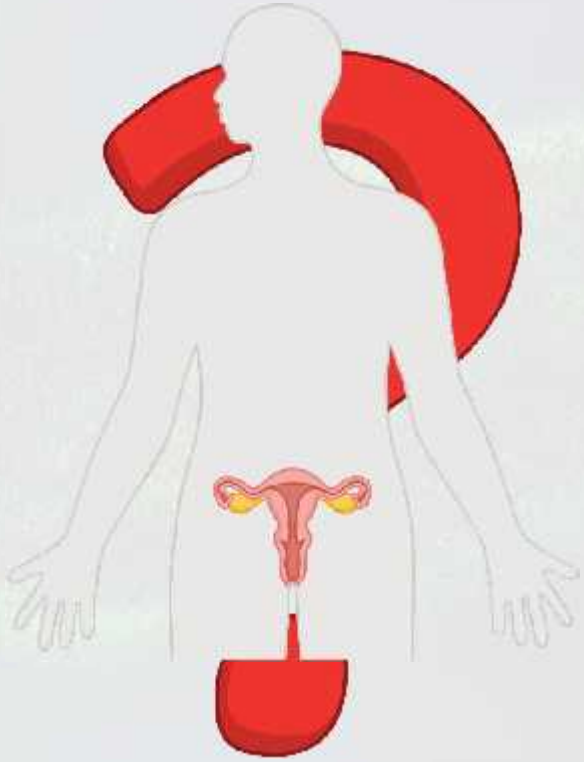
Example of a Tissue
germinal epithelium

Cell
sperm cell

Go to the next slide for more information

Which Organ System?

- muscular skeletal system ✗
- reproductive system ✓
- respiratory system ✗
- immune system ✗
- digestive system ✗
- circulatory system ✗



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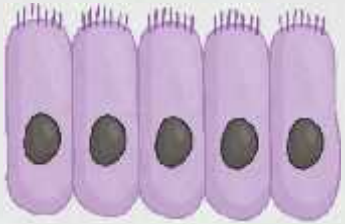
The Small Intestines

Organ
small intestine



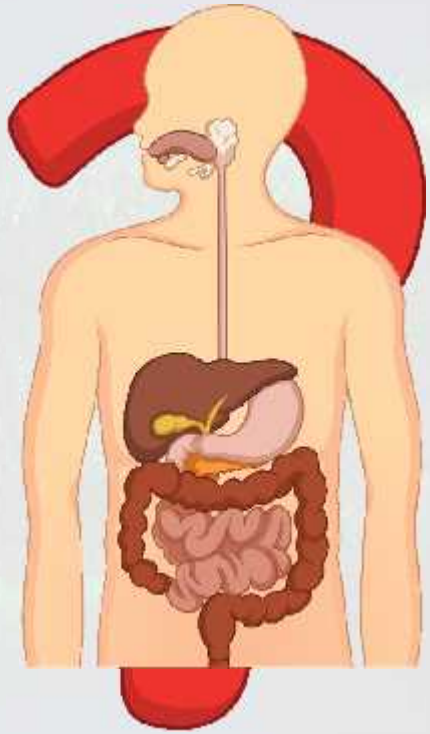
Example of a Tissue
ciliated epithelium

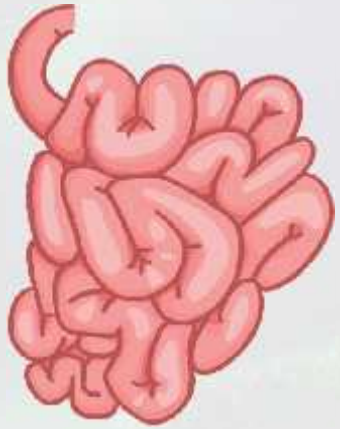
Cell
ciliated epithelium cell

Go to the next slide for more information

Which Organ System?

- muscular skeletal system ✗
- reproductive system ✗
- respiratory system ✗
- immune system ✗
- digestive system ✓
- circulatory system ✗





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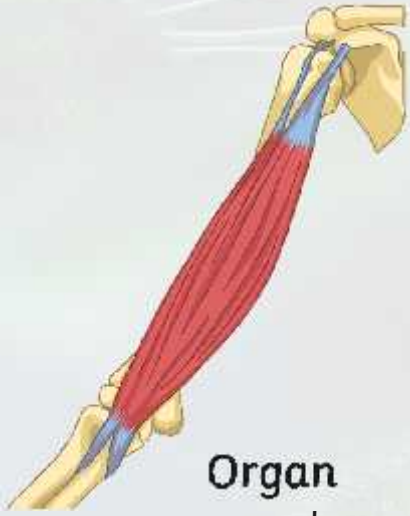
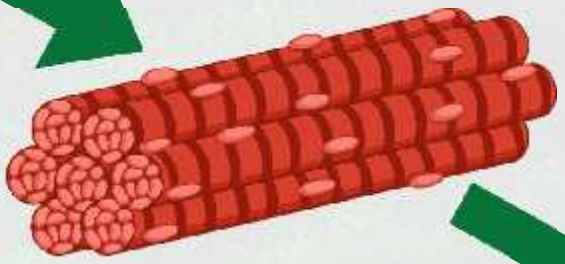
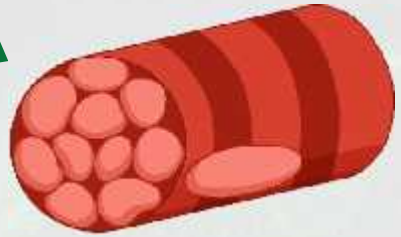
Muscles



Organ
muscle



Example of a Tissue
skeletal muscle tissue

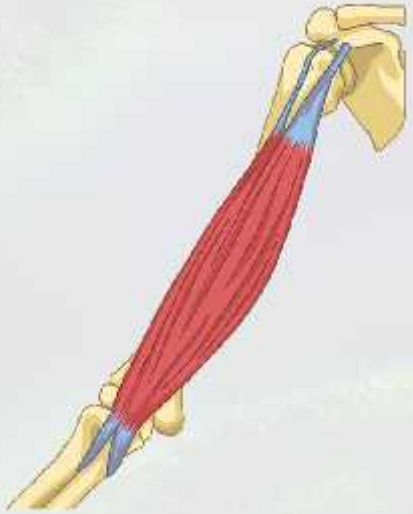


Cell
muscle cell

Go to the next slide for more information

Which Organ System?

- muscular skeletal system ✓
- reproductive system ✗
- respiratory system ✗
- immune system ✗
- digestive system ✗
- circulatory system ✗



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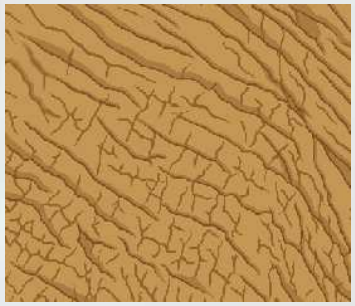
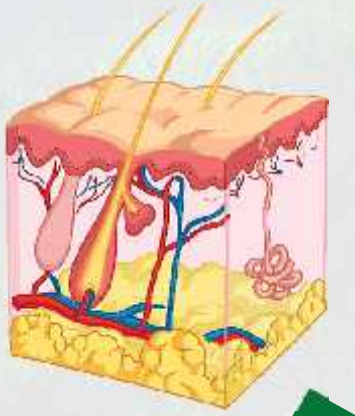
Skin



Organ
skin



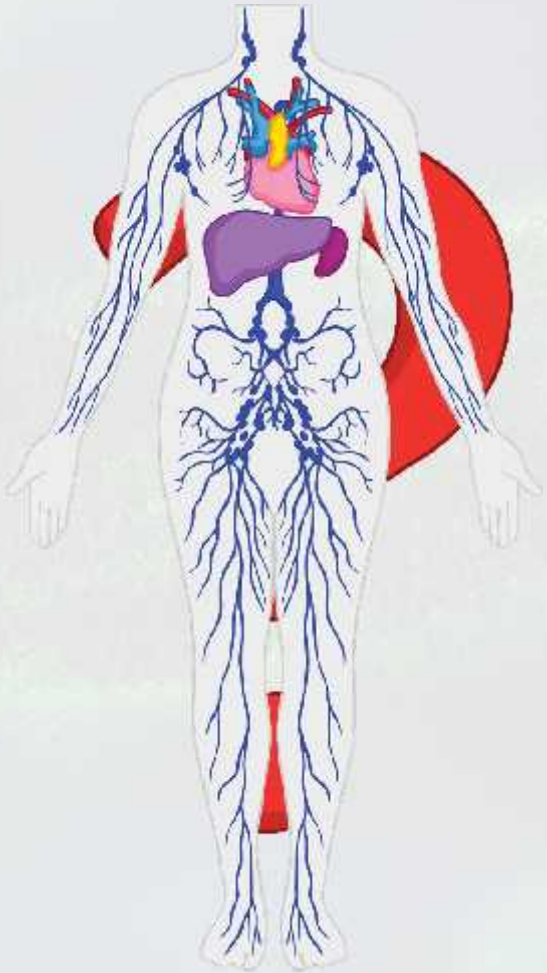
Tissues

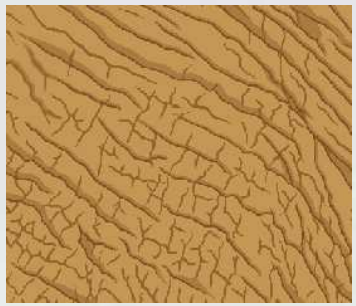
Cells

Go to the next slide for more information

Which Organ System?

- muscular skeletal system ✗
- reproductive system ✗
- respiratory system ✗
- immune system ✓
- digestive system ✗
- circulatory system ✗





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Key Words

Using what you have learnt, can you write a definition for each of the key words below?

cell	The unit of a living organism, contains parts to carry out life processes.
organ system	Group of different organs working together to carry out a job.
tissue	Group of cells of one type.
organ	Group of different tissues working together to carry out a job.

Key Words

Using what you have learnt, can you write the correct key word next to each definition below?

The unit of a living organism, contains parts to carry out life processes.	cell
Group of different organs working together to carry out a job.	organ system
Group of cells of one type.	tissue
Group of different tissues working together to carry out a job.	organ

Organ System Functions

Can you identify the function of each of the six organ systems?

muscular skeletal system	Muscles and bones working together to cause movement and support the body.
reproductive system	Produces sperm and eggs, and is where the foetus develops.
respiratory system	Replaces oxygen and removes carbon dioxide from blood.
immune system	Protects the body against infections.
digestive system	Breaks down and then absorbs food molecules.
circulatory system	Transports substances around the body.

Organ System Functions

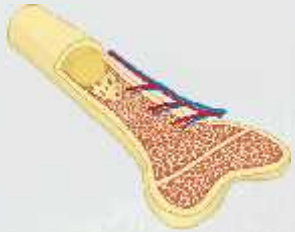
Can you fill in the missing words, using the box of key words, to describe the function of each of the six organ systems?

bones	**movement**	**sperm**	**eggs**	**oxygen**
carbon dioxide	**infections**	**breaks**	**absorbs**	**transports**

muscular skeletal system	Muscles and **bones** working together to cause **movement** and support the body.
reproductive system	Produces **sperm** and **eggs** , and is where the foetus develops.
respiratory system	Replaces **oxygen** and removes **carbon dioxide** from blood.
immune system	Protects the body against **infections**.
digestive system	**Breaks** down and then **absorbs** food molecules.
circulatory system	**Transports** substances around the body.

Where Do These Organs Belong?

mouth



bone marrow

skull

trachea

stomach

large intestine

respiratory system	immune system	muscular skeletal system	respiratory system	digestive system	digestive system

Hierarchy of Organisation

A hierarchy is a way to arrange things due to their relative importance.

Can you produce a diagram that represents the hierarchy of the different levels of organisation?

Hierarchy of Organisation

A hierarchy is a way to arrange things due to their relative importance.

Use the diagram to the right to arrange **cell**, **organ system**, **tissue**, **organism** and **organ** into the correct order.

organism

organ system

organs

tissues

cells

Hierarchy of Organisation

A hierarchy is a way to arrange things due to their relative importance.

Use the diagram to the right to arrange **cell**, **organ system**, **tissue** and **organ** into the correct order.

What is the missing word we need to complete the diagram?

organism

organ system

organs

tissues

cells

Think, Pair, Share

Which is the most important organ?

You need to be able to justify why you think this is the best, what does the system do and which organs does it need? Why couldn't you live with out it?

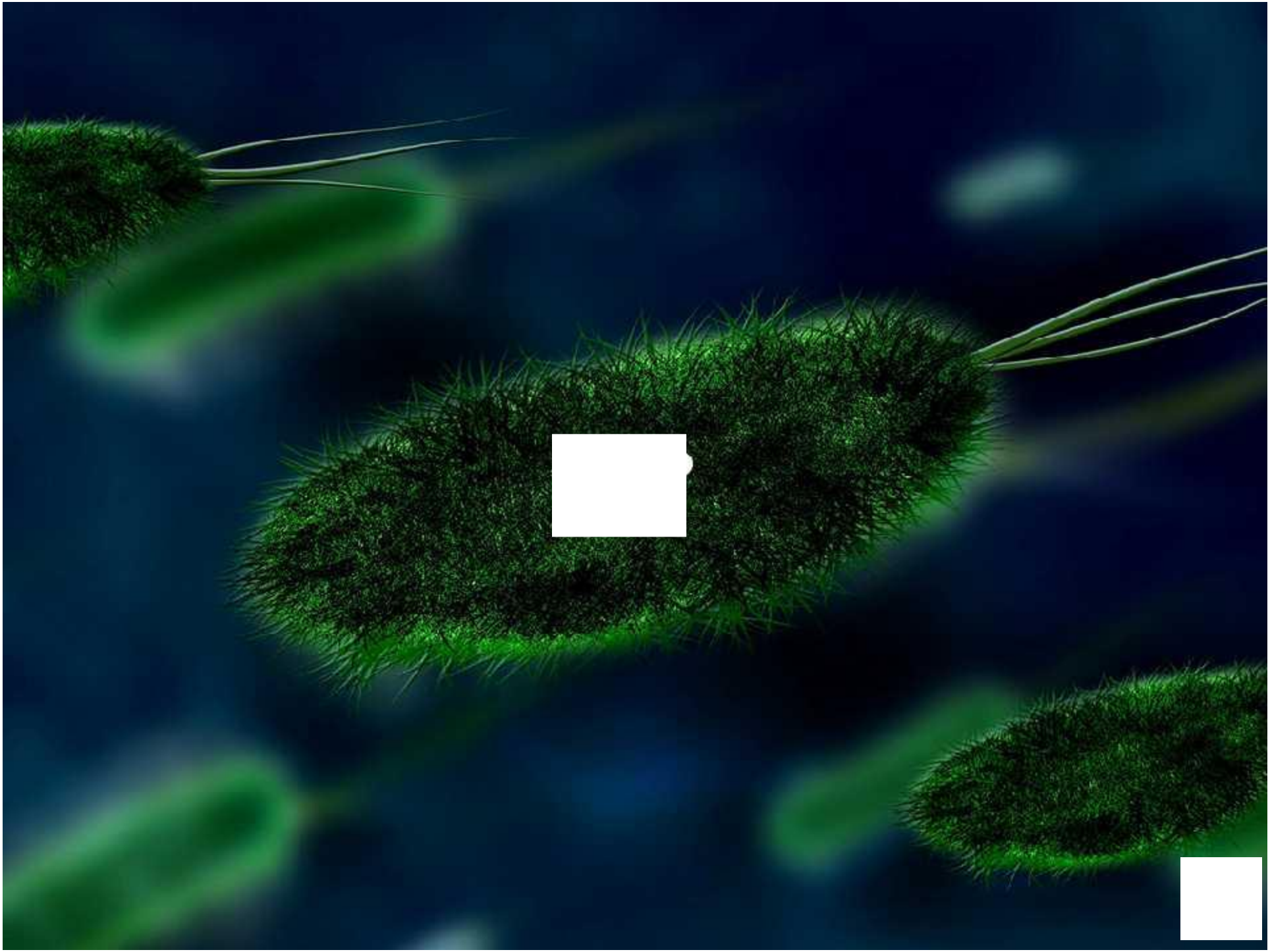
Share your ideas with your table, then as a group, decide which you will share with the class. Be prepared to defend your choice!

Homework

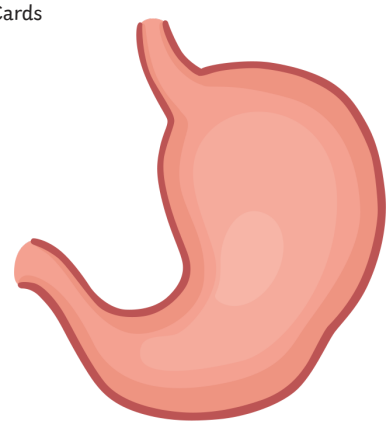
We've covered six organ systems today but there are actually eleven in your body.

Can you find out about one of them?

Next lesson be prepared to share its name, its function in the body, and at least one major organ that you think we'll have heard of before. Happy researching!



Organ Picture Cards

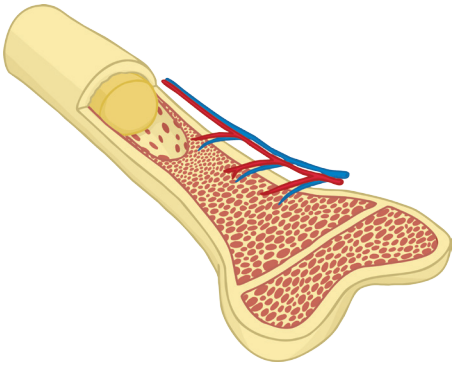


stomach

Organ Picture Cards

mouth

Organ Picture Cards

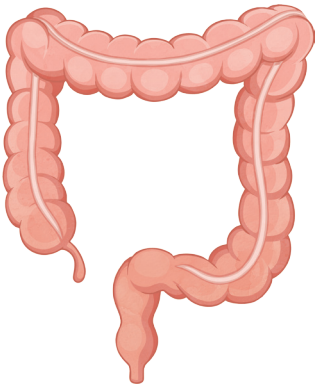


bone marrow

Organ Picture Cards

skull

Organ Picture Cards



large intestine

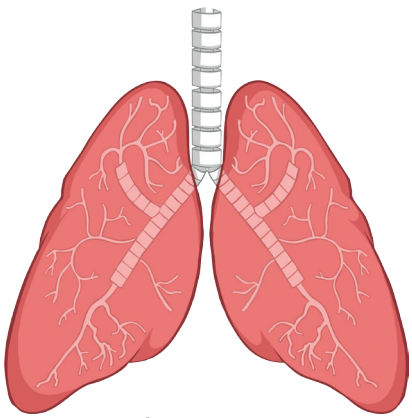
Organ Picture Cards

trachea

Organ Picture Cards

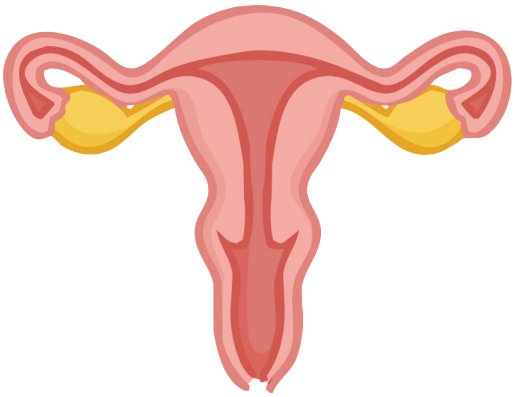
heart

Organ Picture Cards



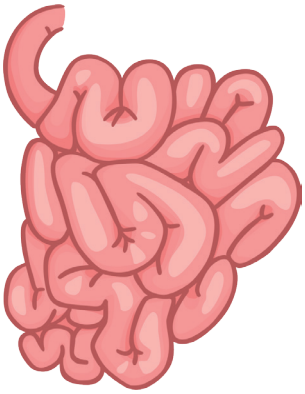
lungs

Organ Picture Cards



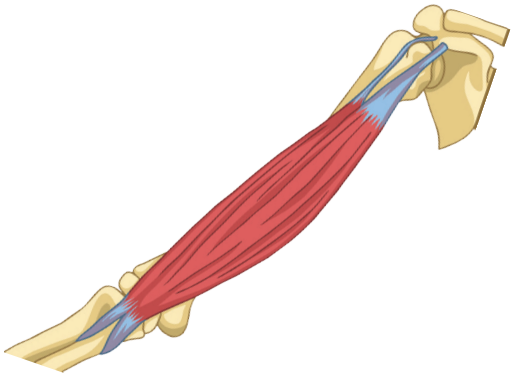
ovaries

Organ Picture Cards



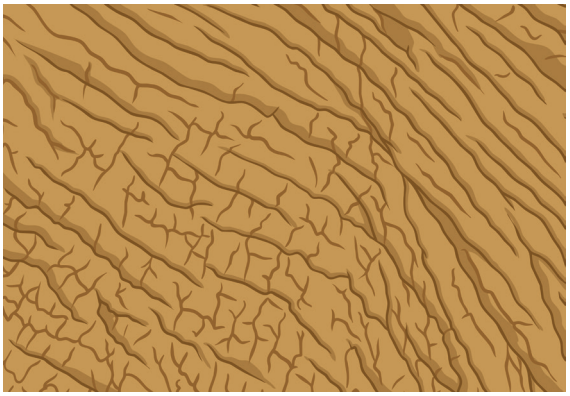
small intestine

Organ Picture Cards



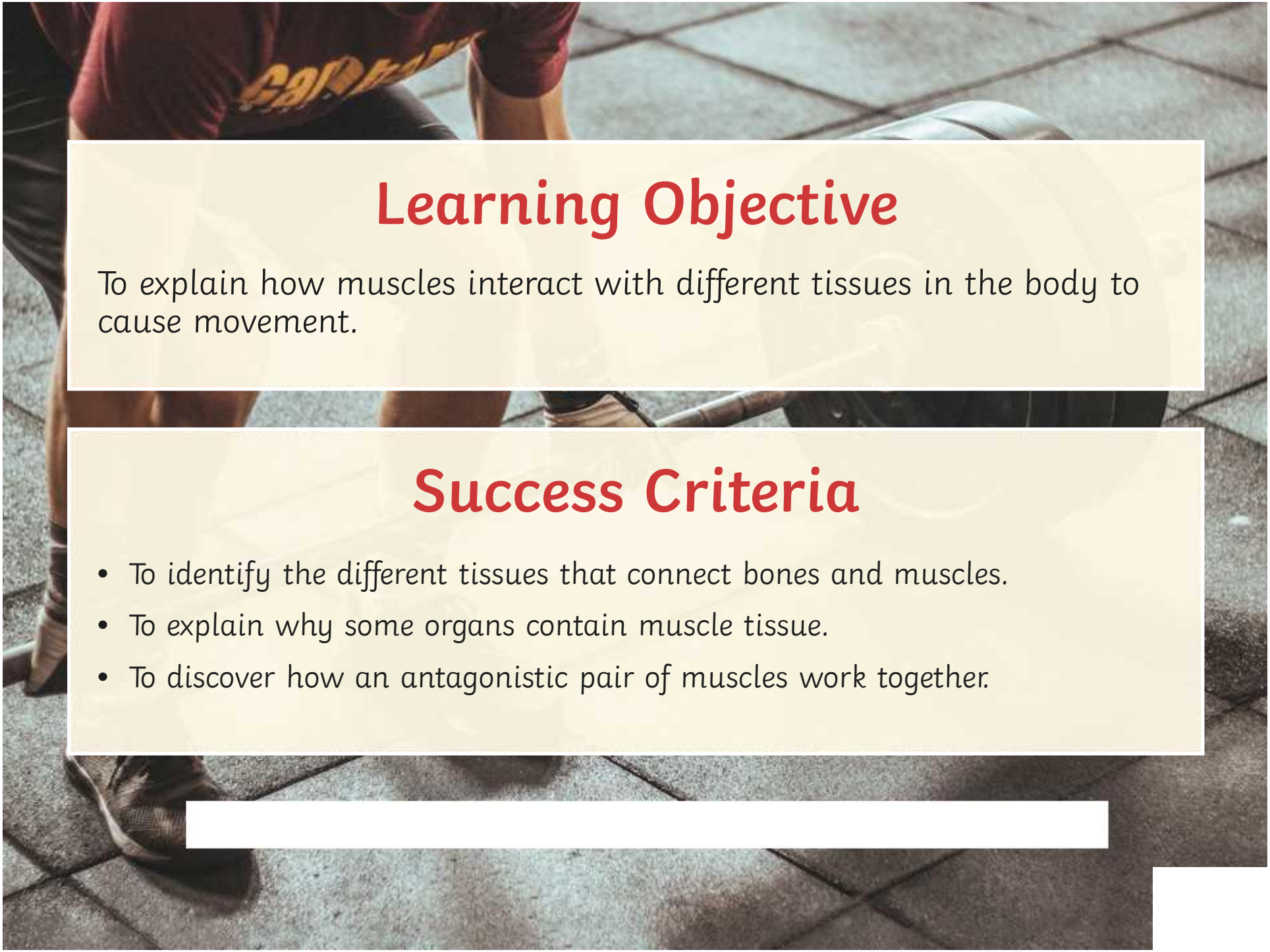
muscles

Organ Picture Cards



skin

Cells and Organisation
Muscles



Learning Objective

To explain how muscles interact with different tissues in the body to cause movement.

Success Criteria

- To identify the different tissues that connect bones and muscles.
- To explain why some organs contain muscle tissue.
- To discover how an antagonistic pair of muscles work together.

Don't Move a Muscle!

Think about all of the muscles in your body. Where do you find them?

Sit facing your partner. You need to tell me if they move any muscles!

You have 30 seconds. Try and keep perfectly still.

Don't Move a Muscle!

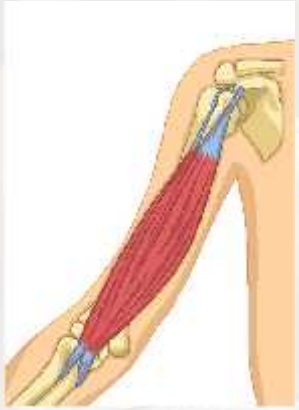
Raise your hand if you think you managed to stay completely still for the whole 30 seconds.

Put your hands down if you blinked.

Put your hands down if you took a breath.

What other organs inside your body will have kept on moving?

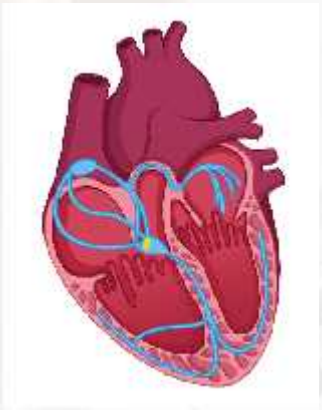
Types of Muscle



Skeletal Muscle

The only muscle type that we consciously control.

Its job is to contract to move parts of the body.



Cardiac Muscle

Only found in the heart.

Involuntary muscle.

Responsible for pumping blood around the body.

Smooth Muscle

Found inside organs like the small intestine, stomach and blood vessels.

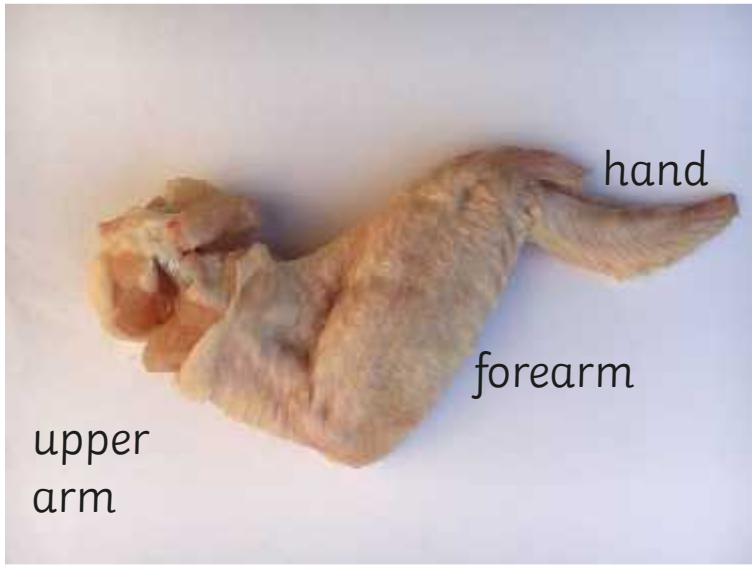
Involuntary muscle.

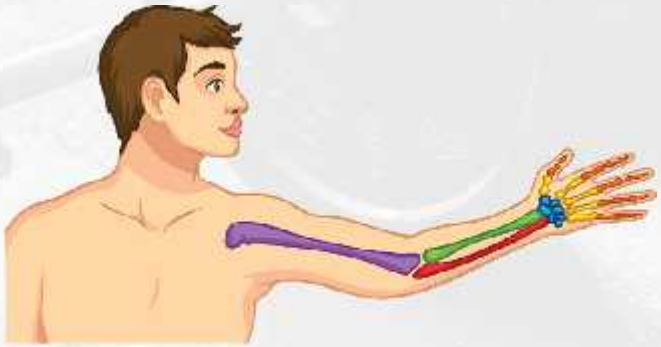
Contracts to move substances through the organ.

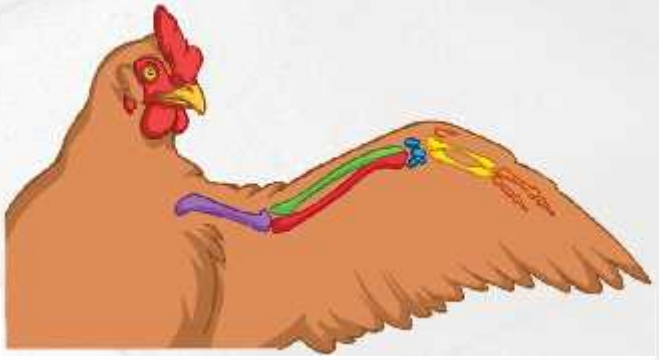
Body Plans

The bones in your arms are similar to the bones in the wing of a bird.

The bones, muscles and other tissues that make the wings of a chicken move work in the same way as the bones, muscles and tissues in your arms.







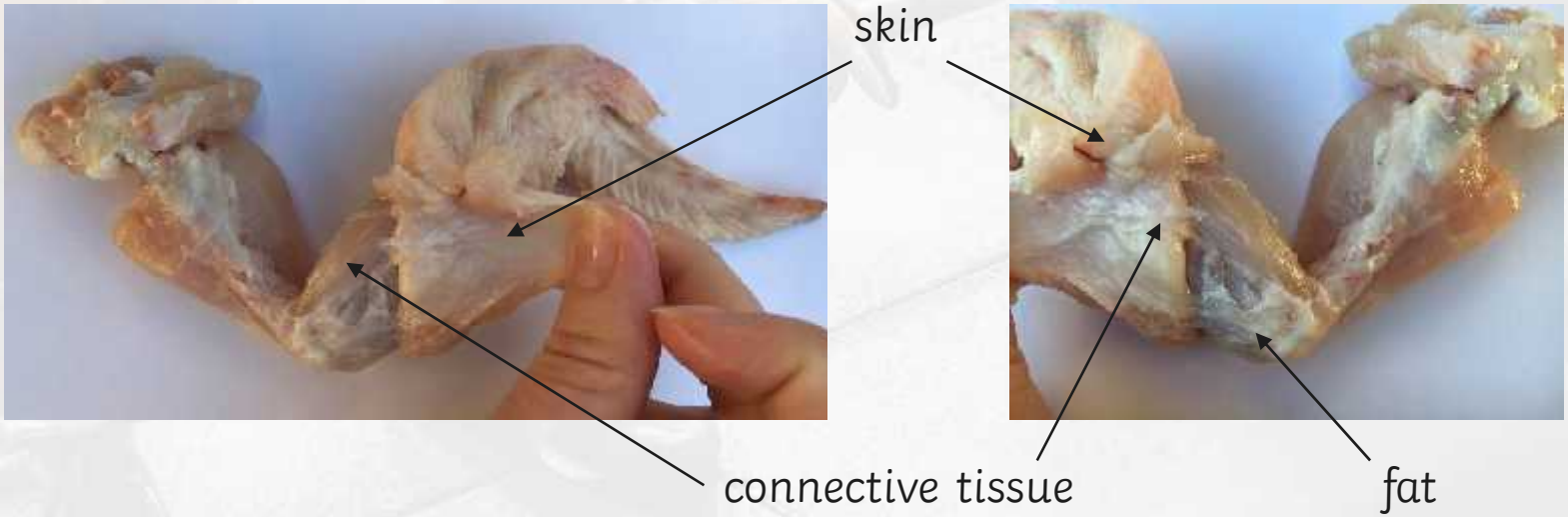
Risk Assessment: Dissection

Hazard	Risk	Procedure
raw chicken	May carry salmonella.	Do not touch your face or equipment during the dissection. Wash hands with disinfectant immediately once finished.
dissection tools	cuts	Cut away from your body and other people. If you cut yourself, apply pressure to the wound and inform teacher.

Dissection: Step One

Carefully peel back the skin from the shoulder down to the wing tip.

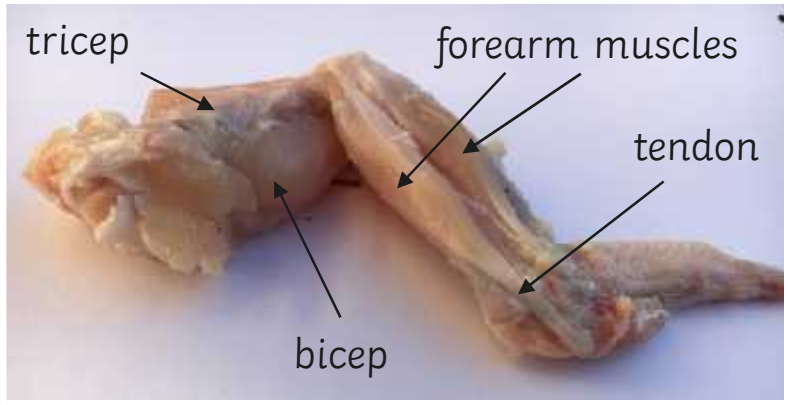
Use the scissors to cut any connective tissue that's holding the skin to the muscle, but be careful not to cut any of the muscle.



Dissection: Step Two

Identify the four main **muscles** of the wings - they are the pink, pale tissue.

Identify the **tendons** - this is the tough, white tissue that connects the muscle to the bone.



Gently pull the two ends of the wing away from each other and watch the muscles. What happens?

Now gently straighten the wing, and holding only the top of the wing pull on the bicep. What happens?

Now gently pull on the forearm muscles, one at a time. Can you make the wing wave hello?

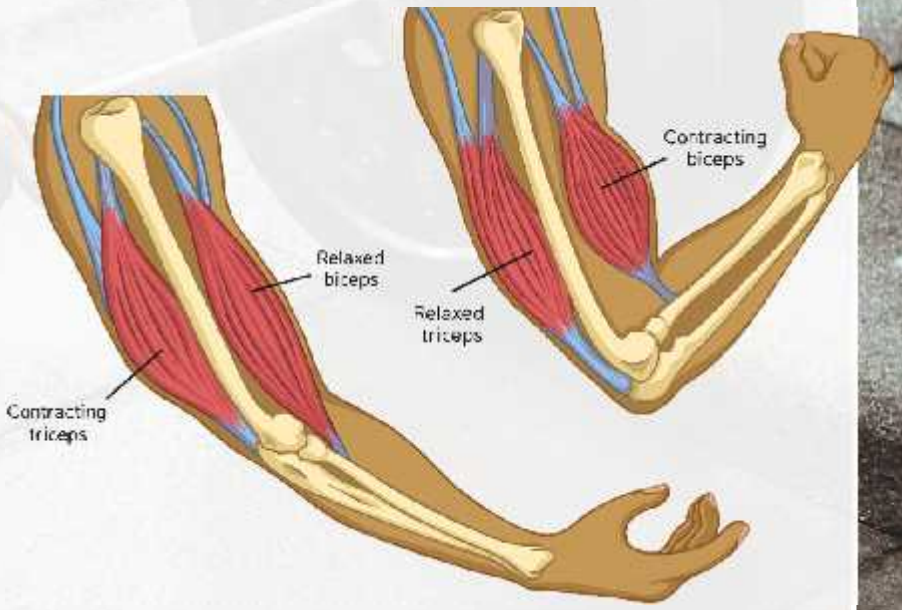
Antagonistic Muscles

Muscles can't push, they can only pull.

This means they have to work together to cause movement. A pair of muscles that work together are called **antagonistic muscles**.

When one muscle contracts, the other muscle relaxes. The joint is pulled in one direction causing movement.

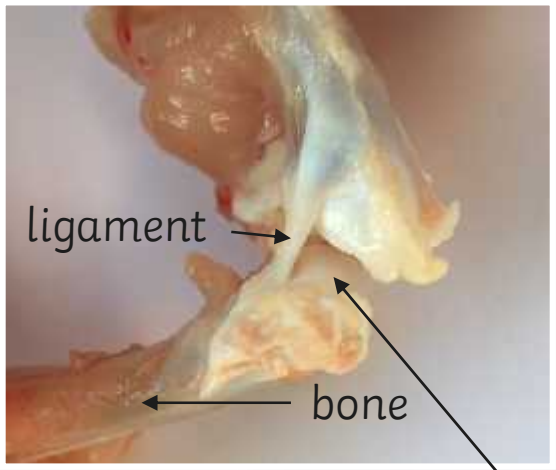
To move in the other direction, the first muscle relaxes and the second muscle contracts. Just like you saw when you made your chicken wing wave hello.



Dissection: Step Three

Cut the tendons around the elbow and pull away the muscles.

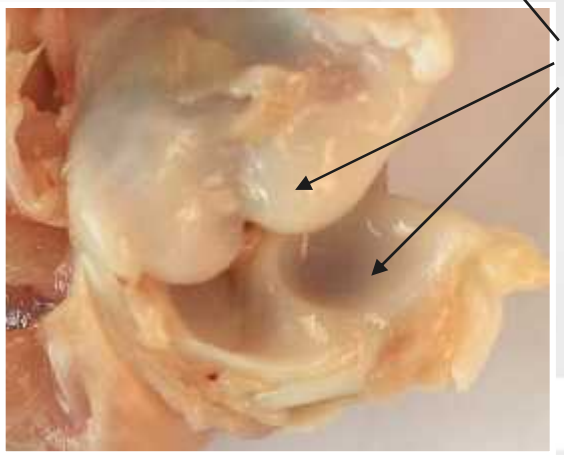
Pull gently on the two bones to open up the joint and have a look inside. Can you spot the ligaments?



Cut the ligaments and have a look at the ends of the bones.

What type of joint is this?

Touch the cartilage at the ends of the bones, how does it feel? How is this different from further down the bone? Scrape both and see how they are different.



Clear Away

1. Scrape all chicken bits into the bin.

2. Put all tools in the bucket of disinfectant.

3. Wash your hands thoroughly using disinfectant. Do not touch the tap. Don't forget to clean under your nails and around your thumbs.

Muscles Activity Sheet

Muscles Activity Sheet

1. What is a muscle?

2. Why do some organs contain muscle? Give some examples.

3. Why does a chicken arm make a good model for us to study?

4. Complete the table below to describe the tissue types that you have seen today.

Tissue	What Does It Look Like?	What Does It Feel Like?	What Is Its Job?
skin			
muscle			
tendon			
ligament			
cartilage			
bone			

5. Two muscles that work together in a pair are called _____

6. Explain why two muscles are needed to bend a joint.

What Will Happen If...?

What will happen if this muscle contracts?

What will happen if this muscle contracts?

What will happen if this muscle contracts?

What will happen if this muscle contracts?

Homework

Produce a short comic strip that shows how bones and muscles work together to carry out a task,

for example,

throwing or kicking a ball.

You must include diagrams of the tissues involved in the task.

Try to include as many keywords in your characters speech as possible.

Key Terms

muscle
antagonistic
bone
ligament
tendon
joint
cartilage

Cells and Organisation: Muscles
Teaching Ideas

Learning Objective:	To explain how muscles interact with different tissues in the body to cause movement.
Success Criteria:	• To identify the different tissues that connect bones and muscles. • To explain why some organs contain muscle tissue. • To discover how an antagonistic pair of muscles work together.
Context	This is the 7th and final lesson of the Cells and Organisation unit of work for key stage 3.

Resources

chicken wings
dissection scissors
dissecting board or tray
bin bags
disinfectant in bucket/tub
disinfectant hand wash
optional:
gloves
aprons

Starter

Don't Move a Muscle!

The purpose of this starter is to highlight to the students that not all our muscles are used for moving joints, and that we don't have voluntary control over all of them.

Challenge students to remain completely still for 30 seconds. You could ask them to sit in pairs opposite each other to keep an eye out for their peers moving. There is a 30 second timer on slide 3.

Slide 4 asks students to raise their hands if they think they were still for the whole 30 seconds. You could ask their partner if they agree. On click there are some points that appear on the slide asking them if they blinked, or breathed during the 30 seconds. The final question prompts them to think about the other organs inside their body that might have been moving, even if their joints were still.

Slide 5 introduces students to the different types of muscle and gives the role of each. At this point you may want students to answer the first two questions (higher ability) or three questions (lower ability) on the Alternatively, you could wait and have students answer the whole sheet at the end of the practical activity.

Main Activities

Dissection

Slide 6 introduces the idea that the tissues in the wings of a bird are similar to the tissues in the arms of a human. The diagram to the right of the slide compares the bones of both, the forearm and upper arm are very similar. You may want to ask students to identify the differences between them, and they may notice that some of the bones that make up our fingers are fused in the bird, you could direct higher ability students to research the body plan of a bats wing at home and report back on what they find. (A bat's wing is more closely related to a human than a bird's is.)

Slide 7 provides a risk assessment to share with students. Teacher note – please check the rules regarding carrying out this kind of experiment in your own learning environment. There is a risk that raw chicken is carrying salmonella, so do ensure that students are carrying out the dissection away from their work and personal belongings. Students should not complete the **Muscles Activity Sheet** while carrying out the dissection. Students should be reminded not to touch their face during the practical and disinfectant hand wash should be provided for hand washing before students return to their personal equipment. Benches should be wiped down with disinfectant after use.

Slides 8, 9 and 11 show step by step instructions for carrying out the dissection. The practical works best if you show the first slide, and let students carry out those steps before moving on, rather than showing them all the slides before they begin. The photographs on the slides are there to help students identify the correct tissues on their wing. Encourage them to move slowly through the practical so that they don't accidently cut the incorrect tissues. There is also a **Dissection Instruction Sheet** available for students to use during the practical (ensure this is thrown away at the end in case it has come into contact with the raw chicken).

Once the skin is removed, let the students take time to play about with the muscles. By holding the top of the bone where the shoulder would be, they should be able to raise the wing by pulling on the bicep and lower it with the tricep. Alternating pulling on the muscles in the forearm will allow them to wave the tip of the wing. This is a great way for them to develop an understanding of how antagonistic muscles work together. The video on slide 9 shows this process. If you have a visualiser to allow you to model the movement to the whole class, this would be useful. Slide 10 offers a summary of how antagonistic muscles work.

As an alternative to a whole class dissection, you could demonstrate the practical underneath a visualiser or with students grouped around a desk. It is beneficial for the students to carry it out themselves though, if at all possible.

Slide 12 is an optional clear away slide to use if your class will need prompting to make sure they clean up properly.

Muscles Activity Sheet

Students should complete the **Muscles Activity Sheet** after the practical is complete and they have washed their hands, not during the dissection. The students are asked to describe the look and feel of the different tissues they have identified during the practical and then note down the role each tissue plays. The lower ability sheet has the functions listed for students to match.

The higher ability sheet asks students to explain why the muscles need to work in pairs, while lower ability students complete a cloze paragraph that explains antagonistic muscles using the keywords on the sheet.

Plenary

What Will Happen If…?

Slide 14 has an illustration of a person leaning back over a gym ball with their muscles on show. The slide points to four different muscle groups and asks students that if those muscles were contracted, what movement would we see?

Homework

Students are asked to produce a comic that shows how muscles and bones work together to cause movement. They should have at least one diagram that shows the structure of the muscle, bone and other tissues and should use speech to include the keywords on the slide.

Dissection Instruction Sheet

Risk Assessment

Hazard	Risk	Procedure
raw chicken	May contain salmonella.	Do not touch your face or equipment during the dissection. Wash hands with disinfectant immediately once finished.
dissection tools	cuts	Cut away from your body and other people. If you cut yourself, apply pressure to the wound and inform teacher.

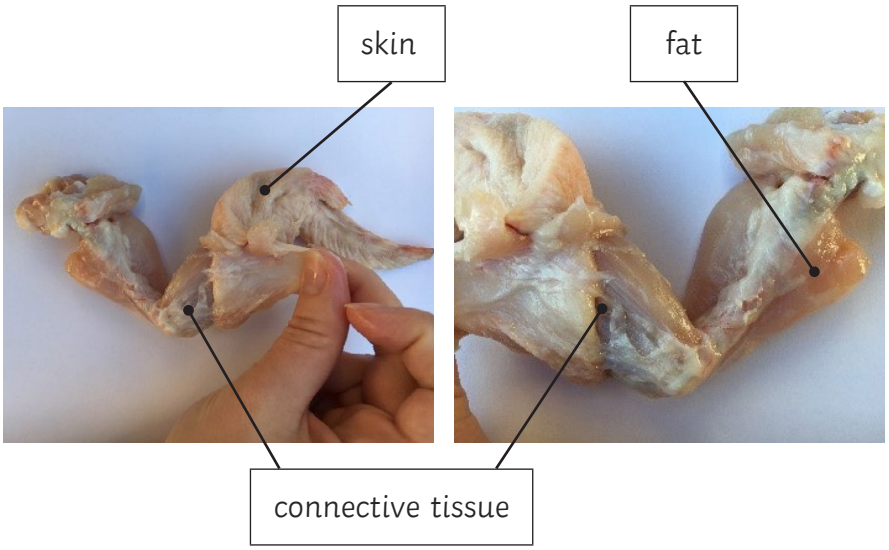
Apparatus

- chicken wing
- dissection scissors
- dissection board or tray
- disinfectant hand wash

Method

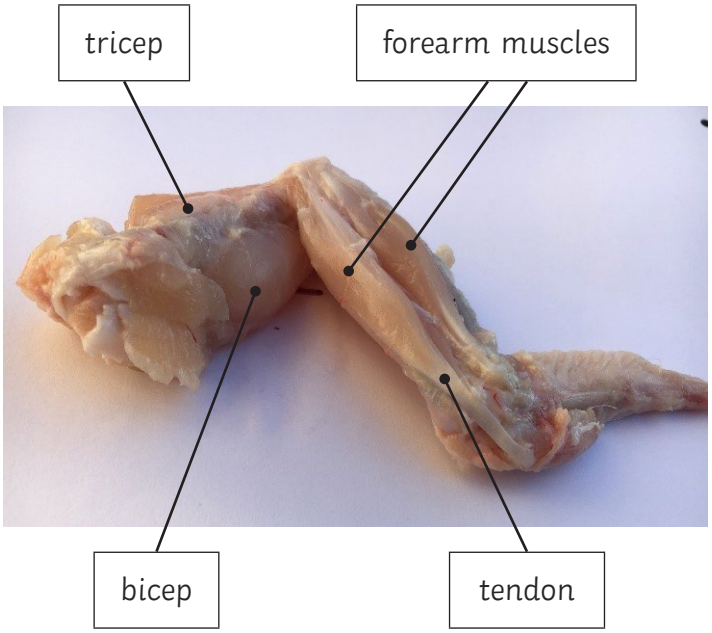
Carefully peel back the skin from the shoulder down to the wing tip.

Use the scissors to cut any connective tissue that's holding the skin to the muscle, but be careful not to cut any of the muscle.



Identify the four main **muscles** of the wings - they are the pink, pale tissue.

Identify the **tendons** - this is the tough, white tissue that connects the muscle to the bone.



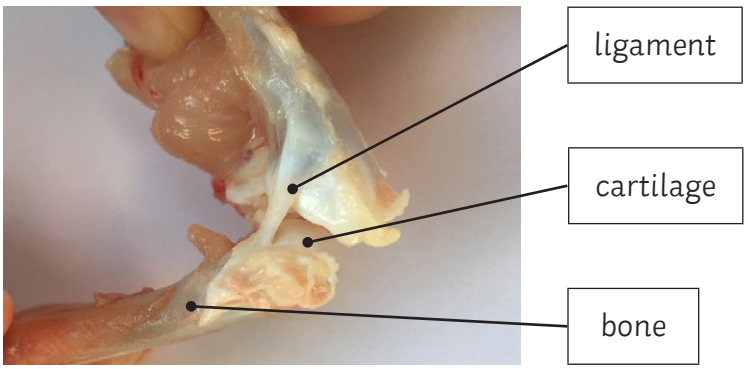
Gently pull the two ends of the wing away from each other and watch the muscles. What happens?

Now gently straighten the wing, and holding only the top of the wing pull on the bicep. What happens?

Now gently pull on the forearm muscles, one at a time. Can you make the wing wave hello?

Cut the tendons around the elbow and pull away the muscles.

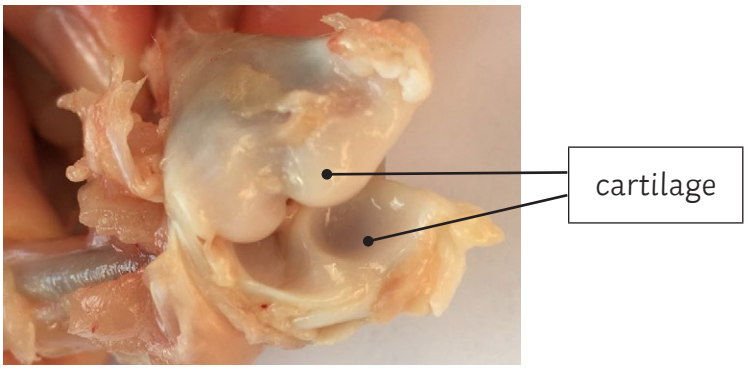
Pull gently on the two bones to open up the joint and have a look inside. Can you spot the ligaments?



Cut the ligaments and have a look at the ends of the bones.

What type of joint is this?

Touch the cartilage at the ends of the bones, how does it feel? How is this different from further down the bone? Scrape both and see how they are different.



Clear Away

- Scrape all chicken bits into the bin.
- Put all tools in the bucket of disinfectant.
- Wash your hands thoroughly using disinfectant. Do not touch the tap. Don't forget to clean under your nails and around your thumbs.

Muscles Activity Sheet

1. What is a muscle?

2. Why do some organs contain muscle? Give some examples.

3. Why does a chicken arm make a good model for us to study?

4. Complete the table below to describe the tissue types that you have seen today.

Tissue	What Does It Look Like?	What Does It Feel Like?	What Is Its Job?
skin			
muscle			
tendon			
ligament			
cartilage			
bone			

5. Two muscles that work together in a pair are called _____.

6. Explain why two muscles are needed to bend a joint.

Muscles Activity Sheet **Answers**

1. A muscle is a bundle of tissue that can contract to cause movement.
2. Organs contain muscle to help move substances around the body. For example, the heart contains cardiac muscle to pump blood, and the organs in the digestive system contain smooth muscle to help push food through the gut. The stomach also uses smooth muscle to churn the food to mix it.
3. The chicken wing has a similar body plan to the upper arm and forearm of a human. The muscles, bones and other tissues work in the same way to cause movement, so studying one helps us to understand the other.
4. Student descriptions may vary but you should be able to distinguish the tissue from their description.

Tissue	What Does It Look Like?	What Does It Feel Like?	What Is Its Job?
skin	pale, pinkish colour	bumpy	To protect the organs from the outside environment.
muscle	pink, rounded	smooth, can be squashed	To contract to cause movement.
tendon	white, long and narrow strip	strong, smooth	To connect muscle to the bone.
ligament	white, long and narrow strip	strong, smooth	To connect one bone to another across a joint.
cartilage	bright white, shiny	very smooth and slippery, can scratch it	To prevent two bones rubbing against each other at a joint.
bone	dull white/grey	hard, difficult to scratch	To support the body.

5. Two muscles that work together in a pair are called antagonistic.
6. Muscles can only pull, they can't push. This means that they must work in pairs. When one muscle contracts the other relaxes, this pulls the joint in one direction causing movement. To move the joint in the other direction, the first muscle must relax while the second contracts.

Muscles Activity Sheet

1. What is a muscle?

2. Why does the heart contain muscle?

3. Why does the stomach contain muscle?

4. Complete the table below to describe the tissue types that you have seen today. Choose the correct job from the options (a-f) below the table.

Tissue	What Does It Look Like?	What Does It Feel Like?	What Is Its Job?
skin			
muscle			
tendon			
ligament			
cartilage			
bone			

a. To connect one bone to another across a joint.

b. To contract to cause movement.

c. To support the body.

d. To prevent two bones rubbing against each other at a joint.

e. To protect the organs from the outside environment.

f. To connect muscle to the bone.

5. Complete the cloze paragraph below with the keywords from this lesson.

movement	pull	antagonistic	relaxes	push	pairs	contracts

Muscles can only _____, they can't _____. This means that they must work in _____. When one muscle _____ the other _____, this pulls the joint in one direction causing _____. Muscles that work together in this way are called _____.

Muscles Activity Sheet **Answers**

1. A muscle is a bundle of tissue that can contract to cause movement.
2. The heart contains (cardiac) muscle to pump blood around the body.
3. The stomach contains (smooth) muscle to churn food and move food through the organ to the small intestine.
4. Student descriptions may vary but you should be able to distinguish the tissue from their description.

Tissue	What Does It Look Like?	What Does It Feel Like?	What Is Its Job?
skin	pale, pinkish colour	bumpy	To protect the organs from the outside environment.
muscle	pink, rounded	smooth, can be squashed	To contract to cause movement.
tendon	white, long and narrow strip	strong, smooth	To connect muscle to the bone.
ligament	white, long and narrow strip	strong, smooth	To connect one bone to another across a joint.
cartilage	bright white, shiny	very smooth and slippery, can scratch it	To prevent two bones rubbing against each other at a joint.
bone	dull white/grey	hard, difficult to scratch	To support the body.

5. Muscles can only **pull**, they can't **push**. This means that they must work in **pairs**. When one muscle **contracts** the other **relaxes**, this pulls the joint in one direction causing **movement**. Muscles that work together in this way are called **antagonistic**.

Organ System Function Cards

Protects your organs.

Organ System Function Cards

Breaks down food.

Organ System Function Cards

Makes new blood cells.

Organ System Function Cards

Discards waste gases.

Organ System Function Cards

Provides support.

Organ System Function Cards

Absorbs water into the blood stream.

Organ System Function Cards

Transports blood cells around the body.

Organ System Function Cards

Takes in oxygen.

Organ System Function Cards

Transports dissolved substances around the body.

Organ System Function Cards

Absorbs nutrients into the blood stream.

Organ System Function Cards

Produces egg cells or sperm cells.

Organ System Function Cards

Helps you to move.

Organ System Function Cards

Controls menstruation.

Organ System Function Cards

Produces hormones to regulate the reproductive cycle.

Organ System Function Cards

Protects against disease.

Organ System Function Cards Answer Sheet

Skeleton

- Protects your organs.
- Provides support.
- Helps you to move.
- Makes new blood cells.

Circulatory system

- Transports dissolved substances around the body.
- Transports blood cells around the body.

Digestive system

- Breaks down food.
- Absorbs nutrients into the blood stream.
- Absorbs water into the blood stream.

Immune system

- Protects against disease.

Respiratory system

- Discards waste gases.
- Takes in oxygen.

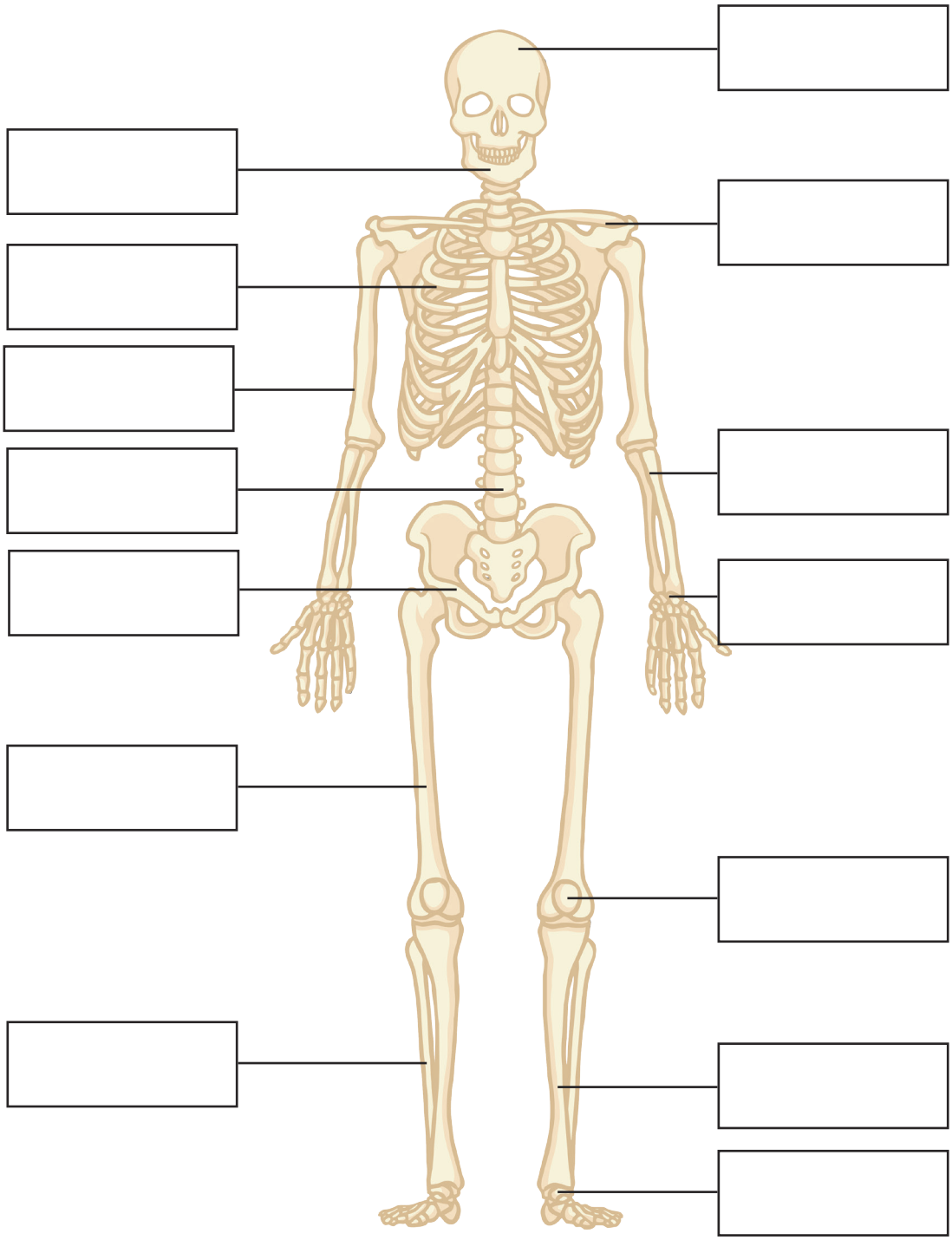
Reproductive system

- Produces egg cells or sperm cells.
- Produces hormones to regulate the reproductive cycle.
- Controls menstruation.

Skeleton Activity Sheet

What is a bone?

Label the skeleton with the main bones of the body.



Describe the functions of the skeleton, with examples.

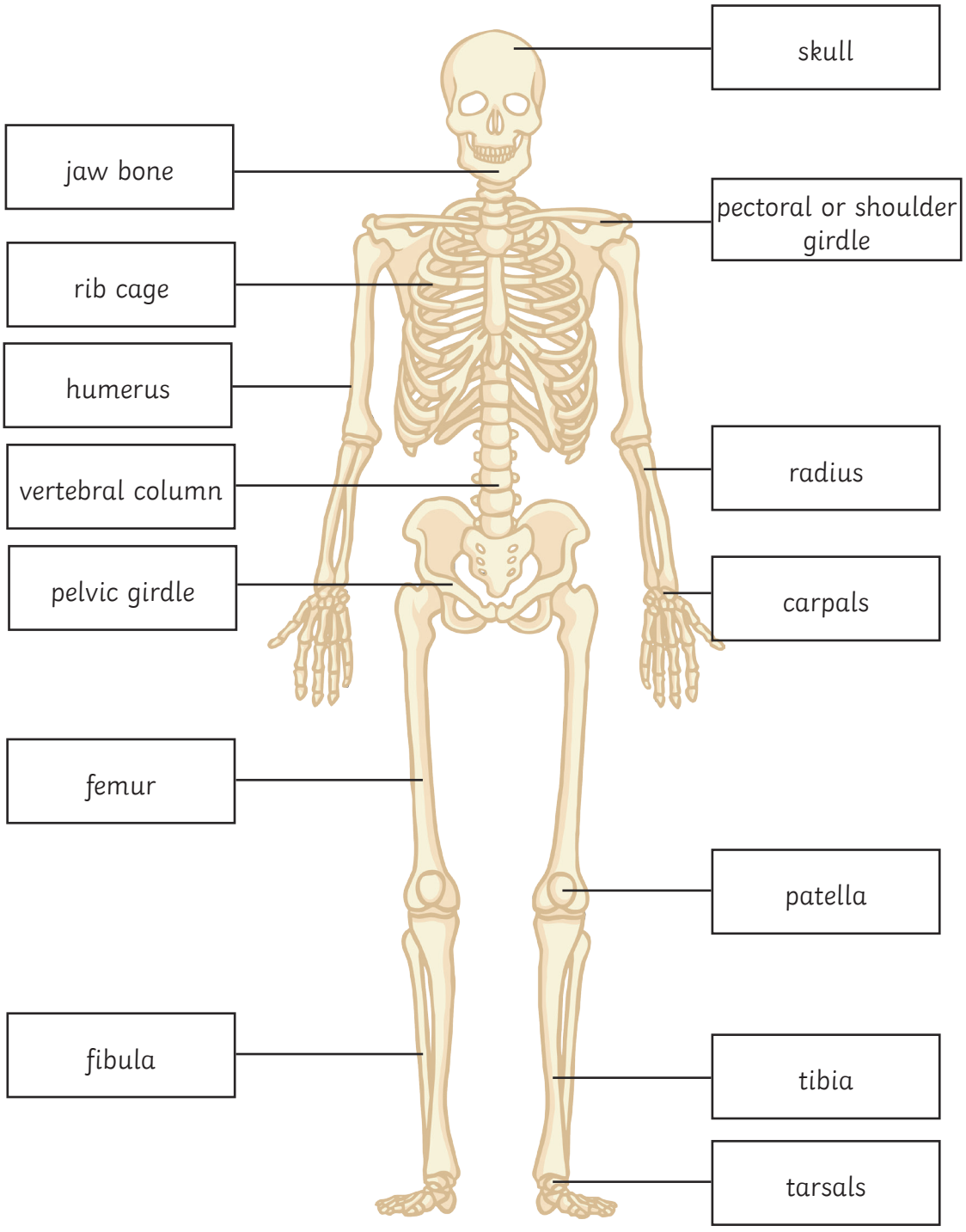
What is a joint?

Use the box below to show what ball and socket and hinge joints look like.

Skeleton Activity Sheet Answers

1. A bone is a living tissue. It has a blood supply and can grow and repair itself.

2.



3. The first function of the skeleton is to support the body, so it can stay upright.
   Secondly, the skeleton protects important organs in the body. For example, the skull protects the brain, the spinal cord is protected by the backbone and the heart and lungs are protected by the rib cage. The bones of the skeleton also work together with the muscles and joints to help us move. Finally, the bone marrow in the middle of some bones means the skeleton can make red and white blood cells.

4. A joint is where two bones join and are held together by ligaments. The cartilage and fluid in the joints stops the bones from rubbing against each other.

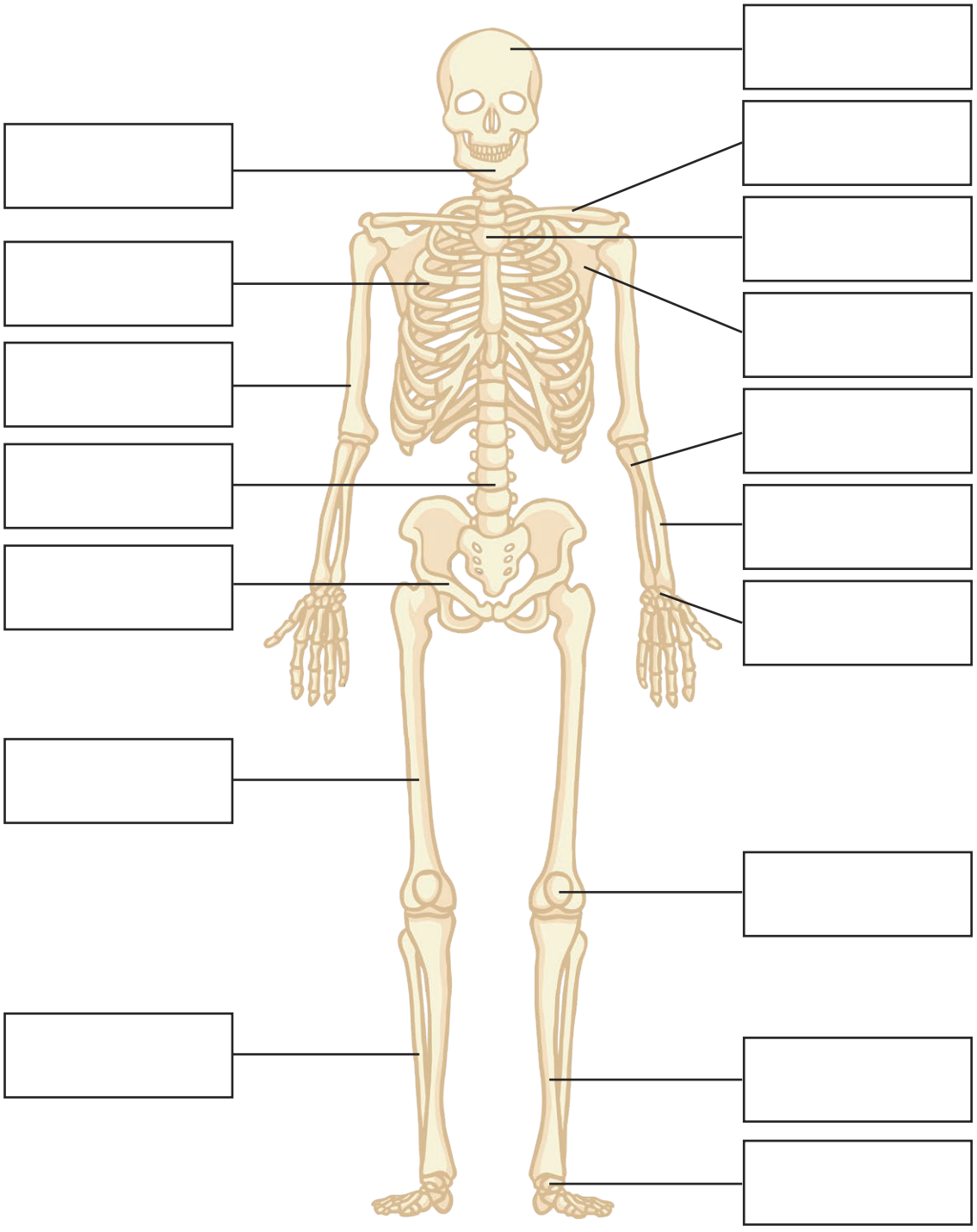
5. Diagrams of the ball and socket and hinge joints that give a simple model of how the joints move and have cartilage, ligament and fluid labelled correctly.

Skeleton Activity Sheet

1. What is a bone?

2. Label the skeleton with the main bones of the body.
   Key words:

carpals	clavicle	cranium	femur	fibula	humerus
mandible	patella	pelvis	radius	ribs	scapula
sternum	tibia	talus	ulna	vertebrae	



3. Describe the functions of the skeleton, with examples.
   Keywords

support	protection	joints	bones	bone marrow
spinal cord	brain	heart	muscles	

The first function of the skeleton is _____

_____

Secondly, the skeleton _____

_____

Another function of the skeleton is _____

_____

The final function of the skeleton is _____

_____

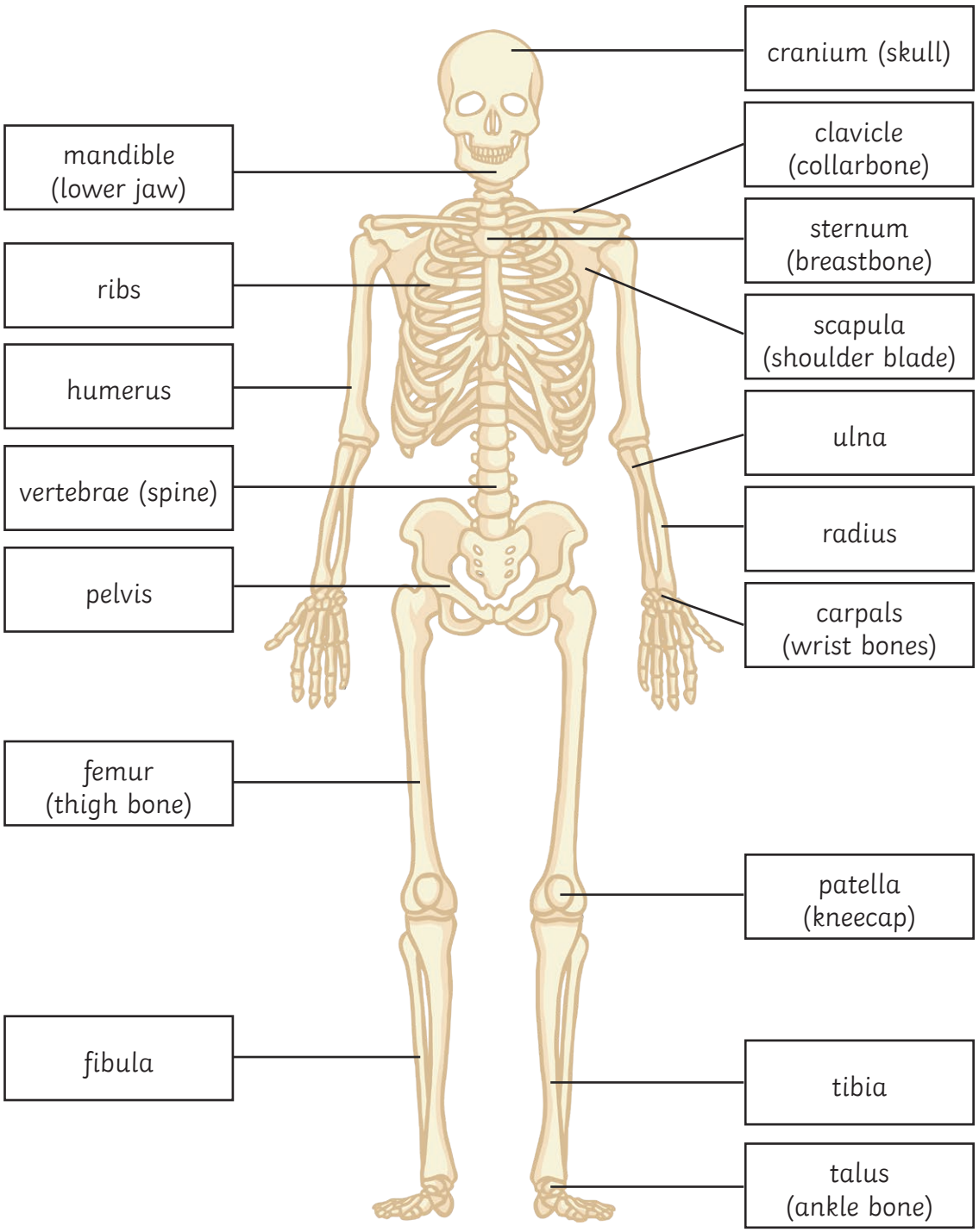
4. What is a joint?

_____

_____

5. Use the box below to show what ball and socket and hinge joints look like.

Skeleton Activity Sheet Answers



1. A bone is a living tissue. It has a blood supply and can grow and repair itself.

2.

3. The first function of the skeleton is to support the body, so it can stay upright.
   Secondly, the skeleton protects important organs in the body. For example, the skull protects the brain, the spinal cord is protected by the backbone and the heart and lungs are protected by the rib cage. The bones of the skeleton also work together with the muscles and joints to help us move. Finally, the bone marrow in the middle of some bones means the skeleton can make red and white blood cells.

4. A joint is where two bones join and are held together by ligaments. The cartilage and fluid in the joints stops the bones from rubbing against each other.

5. Diagrams of the ball and socket and hinge joints that give a simple model of how the joints move and have cartilage, ligament and fluid labelled correctly.

Cells and Organisation
The Skeleton

Learning Objective

- To explain the role of the skeleton in the human body.

Success Criteria

- To identify the main bones in the skeleton.
- To describe how the skeleton protects vital organs.
- To explain how the skeleton protects against infection.

The Skeleton

Imagine people without a skeleton, what would they be like?

What is a bone?

How many bones can you name?

Bones: True or False?

Bones are tissues that have died and hardened to provide support.

Babies have more bones than adults.

The noses of skulls are very delicate and often get knocked off when they are excavated before they can be studied.

You are taller when you wake up than when you go to bed.

Bone Facts

Bones are living tissues with a blood supply. They grow and can repair themselves too.

The skull has joints that allow it to be squashed during childbirth. The joints close as children grow up. This fusing of bones during growth means that although babies are born with around 300 bones, an adult has only 206.

The nose is made of cartilage, not bone, which is why skulls have no noses.

The vertebrate discs in your spine become compressed during the day, this means that you are about 1cm shorter by the end of the day then you were when you got up! Have you noticed that older relatives seem to get shorter every time you visit? It's because as you get older those discs get permanently compressed.

Skeleton Relay

One person from your group will come and look at the drawing on the desk. They will have 30 seconds to remember all that they can.

After 30 seconds they will return to their group and draw what they can remember.

Meanwhile person 2 will come up and have 30 seconds to remember what they can.

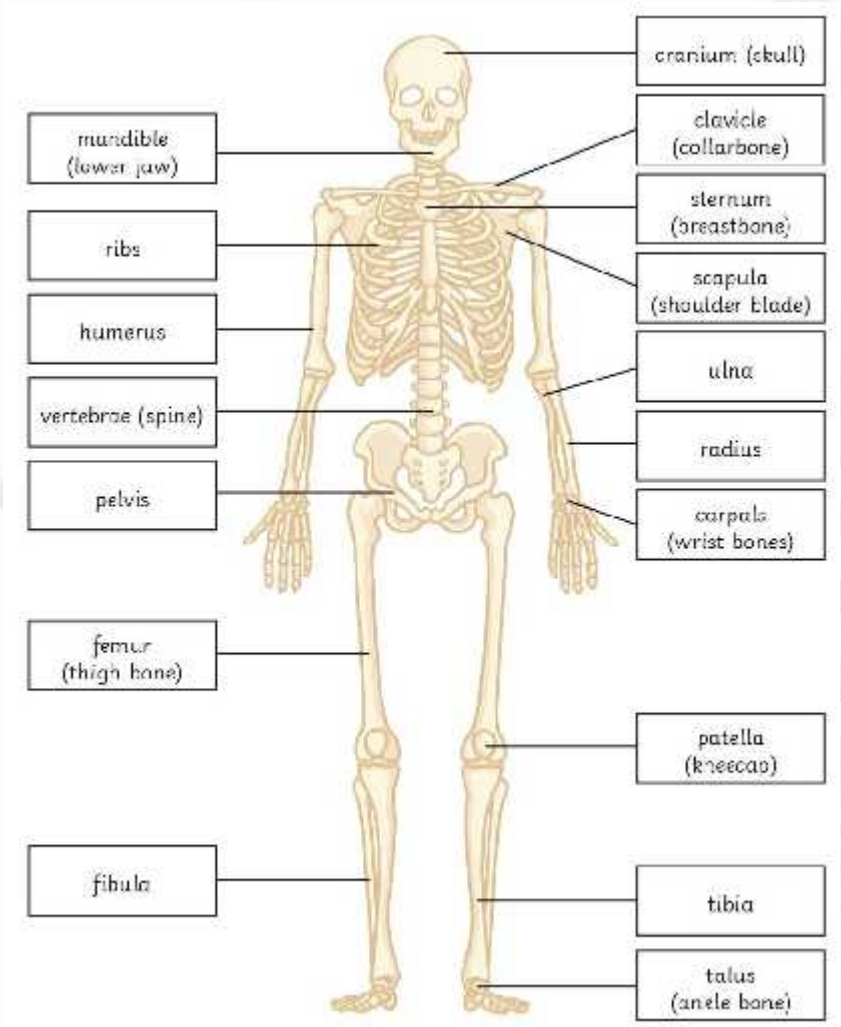
After 30 seconds they will return to their group and draw what they can remember, while person 3 comes up to view.

Remember to communicate with each other, let the next person know which area to focus on and **don't forget the labels**!

00:00

Skeleton Relay

Skeleton Relay



Skeleton Functions

Which of these jobs are carried out by the skeleton?

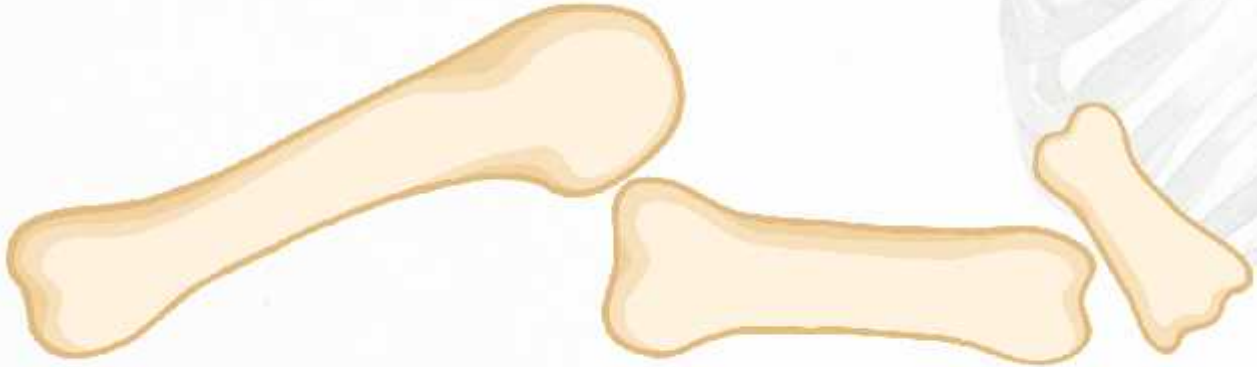
Protects your organs.	Breaks down food.	Makes new blood cells.
Discards waste gases.	Provides support.	Absorbs water into the blood stream.
Transports blood cells around the body.	Takes in oxygen.	Transports dissolved substances around the body.
Absorbs nutrients into the blood stream.	Produces egg cells or sperm cells.	Helps you to move.
Controls menstruation.	Produces hormones to regulate the reproductive cycle.	Protects against disease.

Support

Without bones your body would be floppy.

The skeleton provides a frame to hold your body upright and keep your organs in place.

Animals without a skeleton are usually small and live in water. Why do you think this is?



Protection

Bones are hard and strong so that they can protect important organs.
Which bones protect these organs?

brain

skull

lungs

ribcage

heart

ribcage

spinal cord

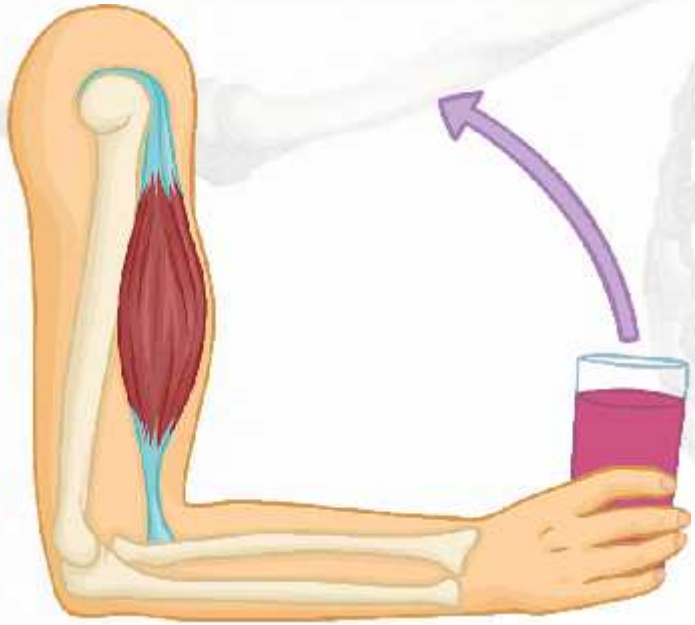
vertebral column

Movement

Your bones and muscles work together to make you move.

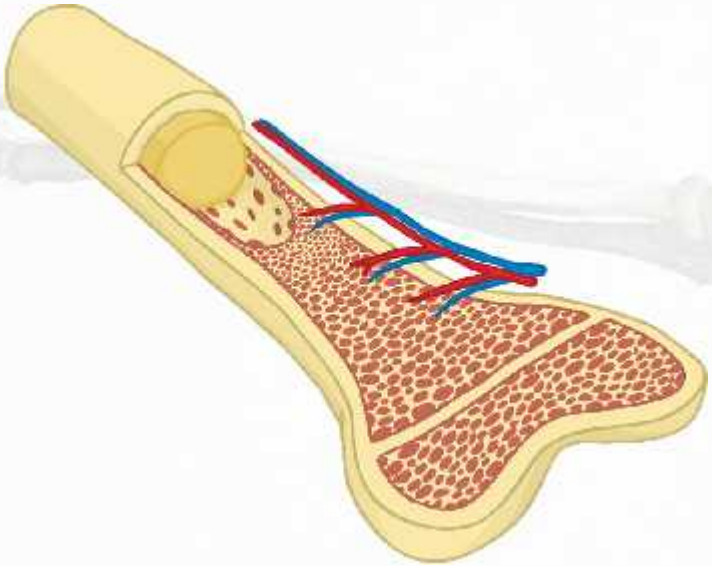
Muscles are attached to bones, when they pull on a bone they make it move at a joint.

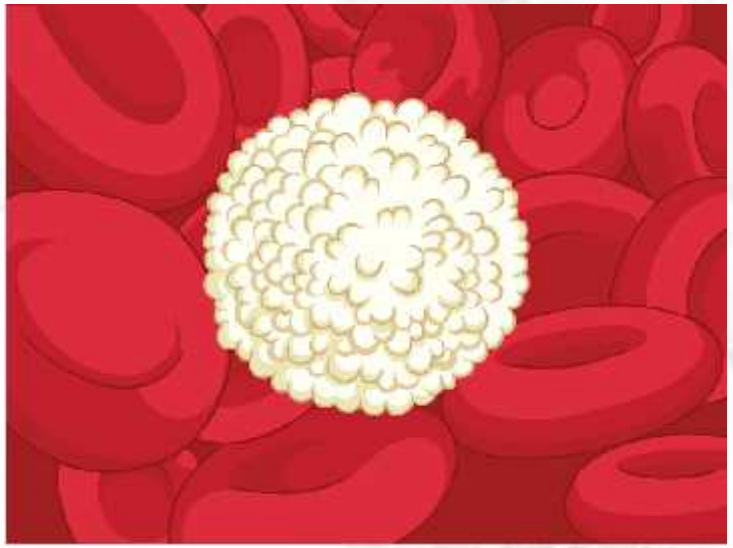
This combination of muscles, bones and joints making us move is called **biomechanics**.



Making Blood Cells

In the centre of some of your long bones is a soft tissue called bone marrow.
The bone marrow produces red and white blood cells.
What do the red and white blood cells do?





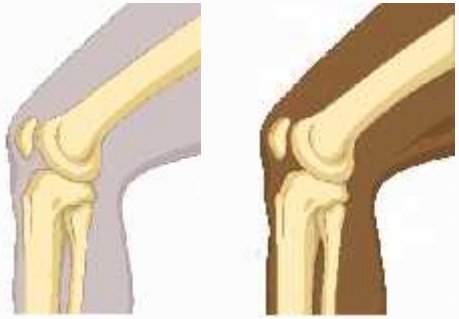
Joints

Joints occur where bones join together.

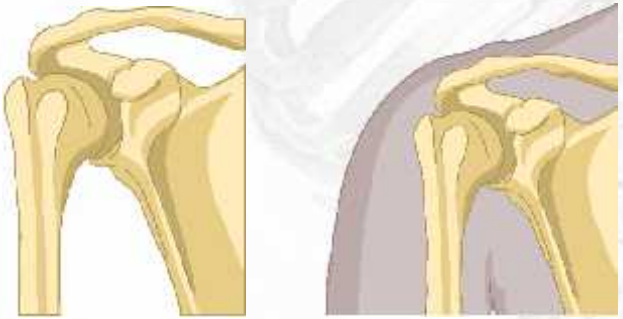
Sometimes these joints are fixed and can't move, for example where the bones of the skull fuse together.

Most of the time joints are flexible and allow the body to move.

A hinge joint allows backwards and forwards movements. Knees and elbows are hinge joints.



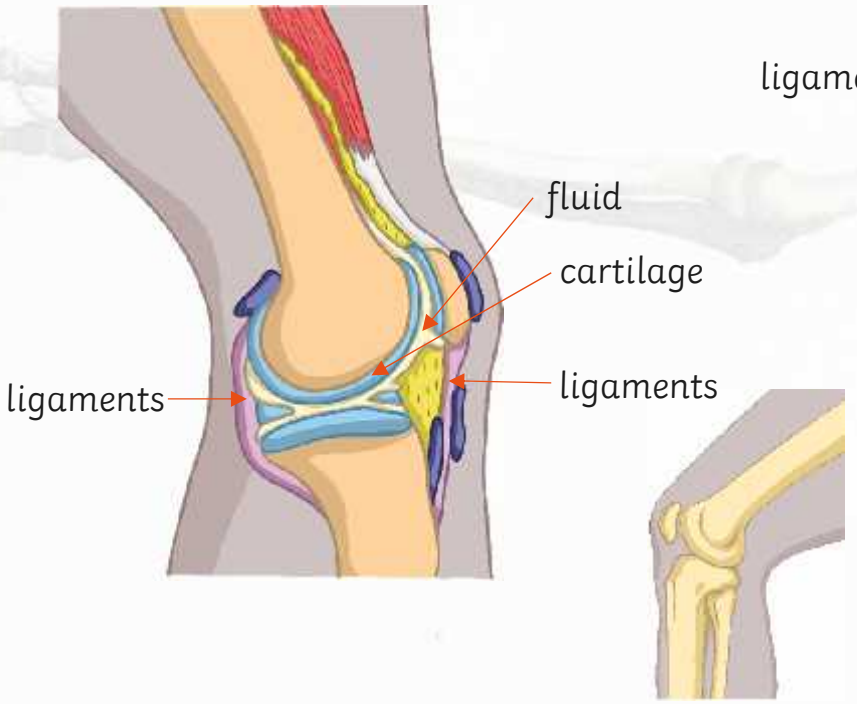
A ball and socket joint allows movement in all directions. Shoulders and hips are ball and socket joints.

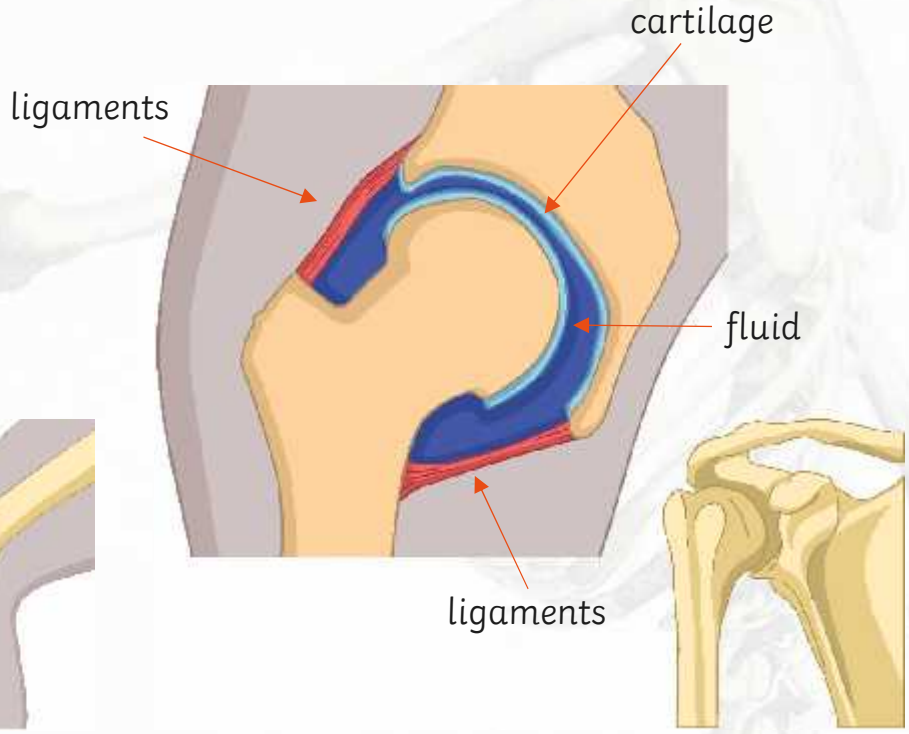


Joints

If the bones rubbed together they would get damaged and hurt, to prevent this the ends of the bones are covered with a strong, smooth layer of **cartilage**. This is kept slippery by **fluid** in the joint.

The bones are held together in the joint by **ligaments**.

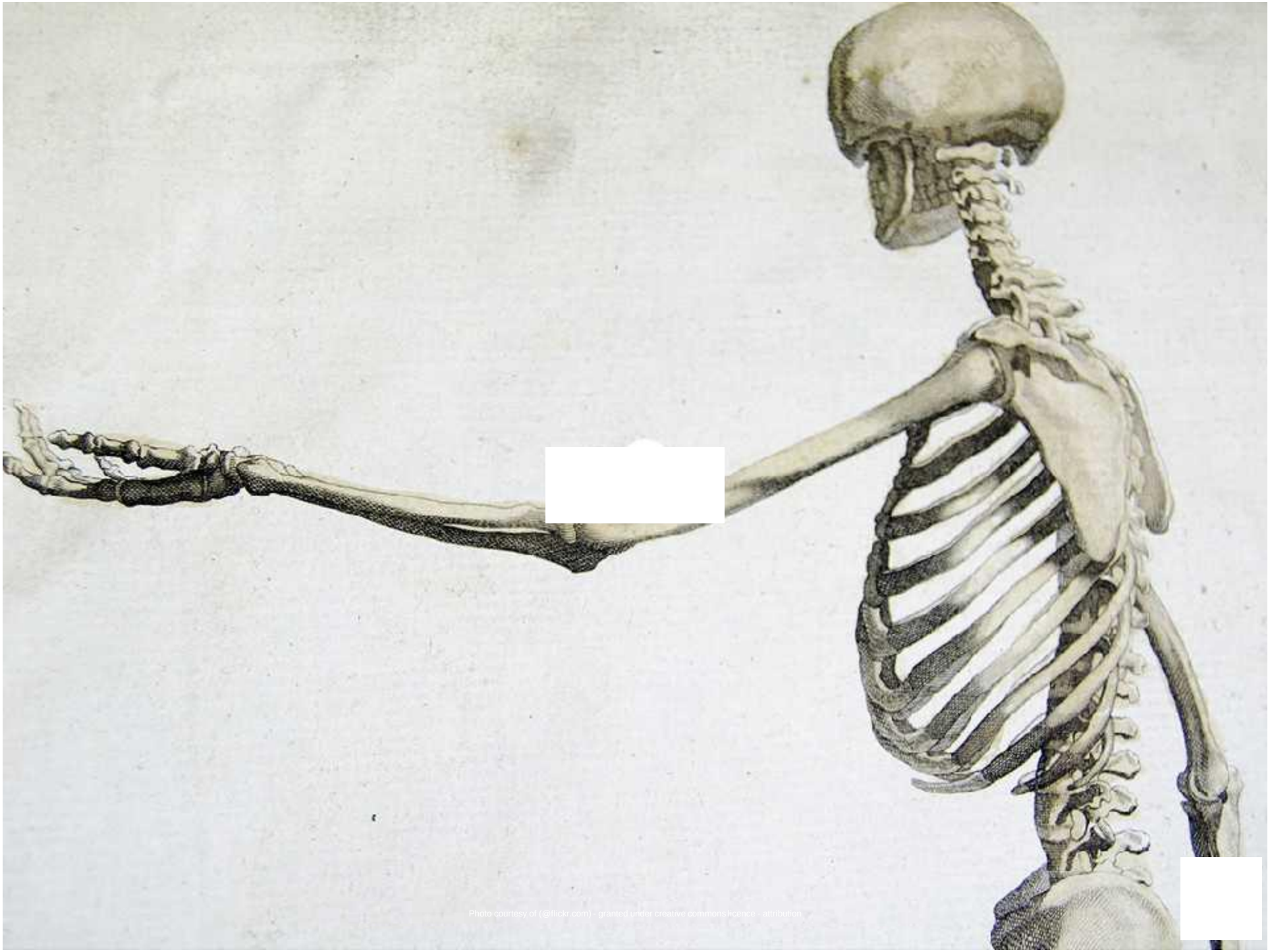




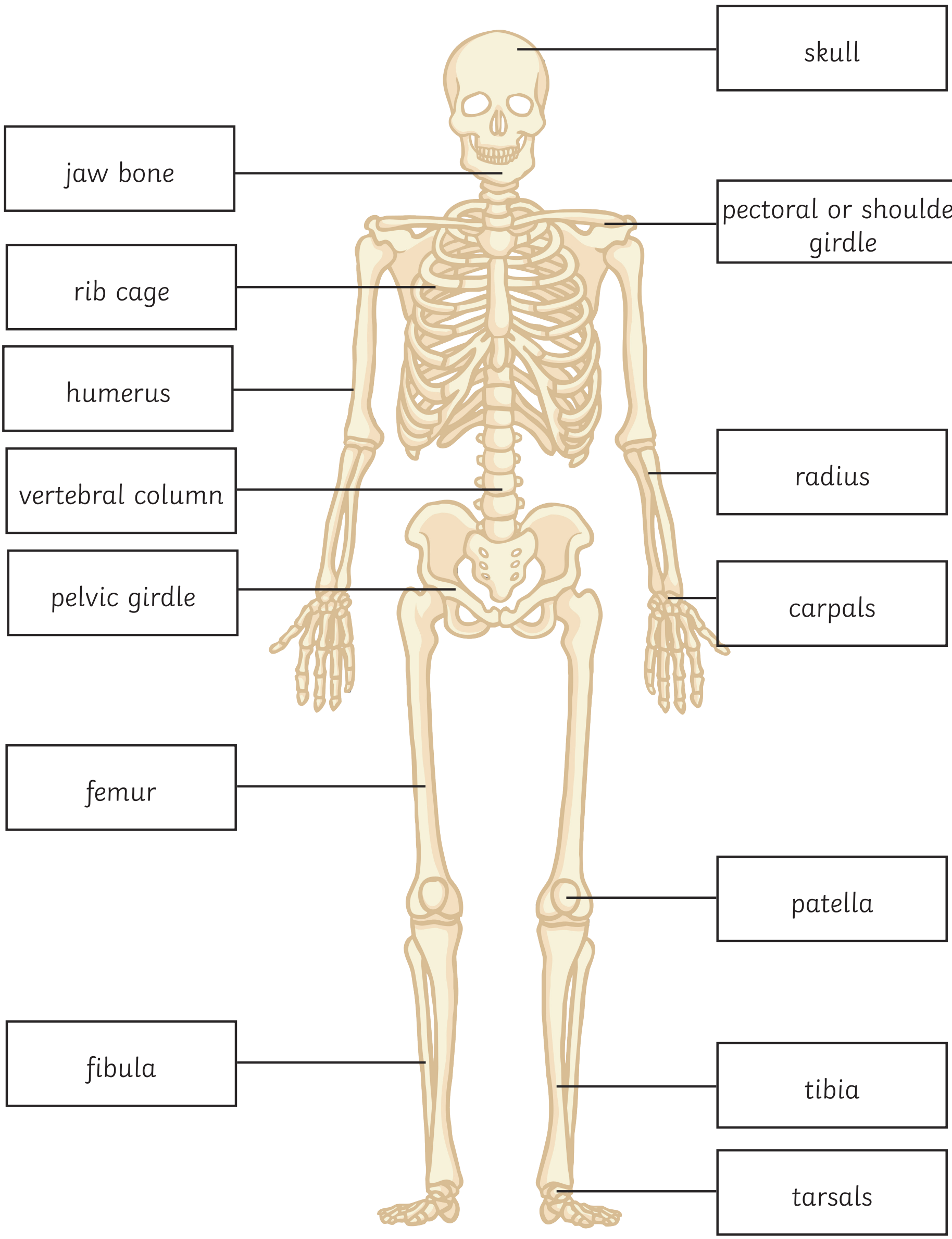
Skeleton Race

Can you be the fastest team to label your team mate with the main bones of the body?

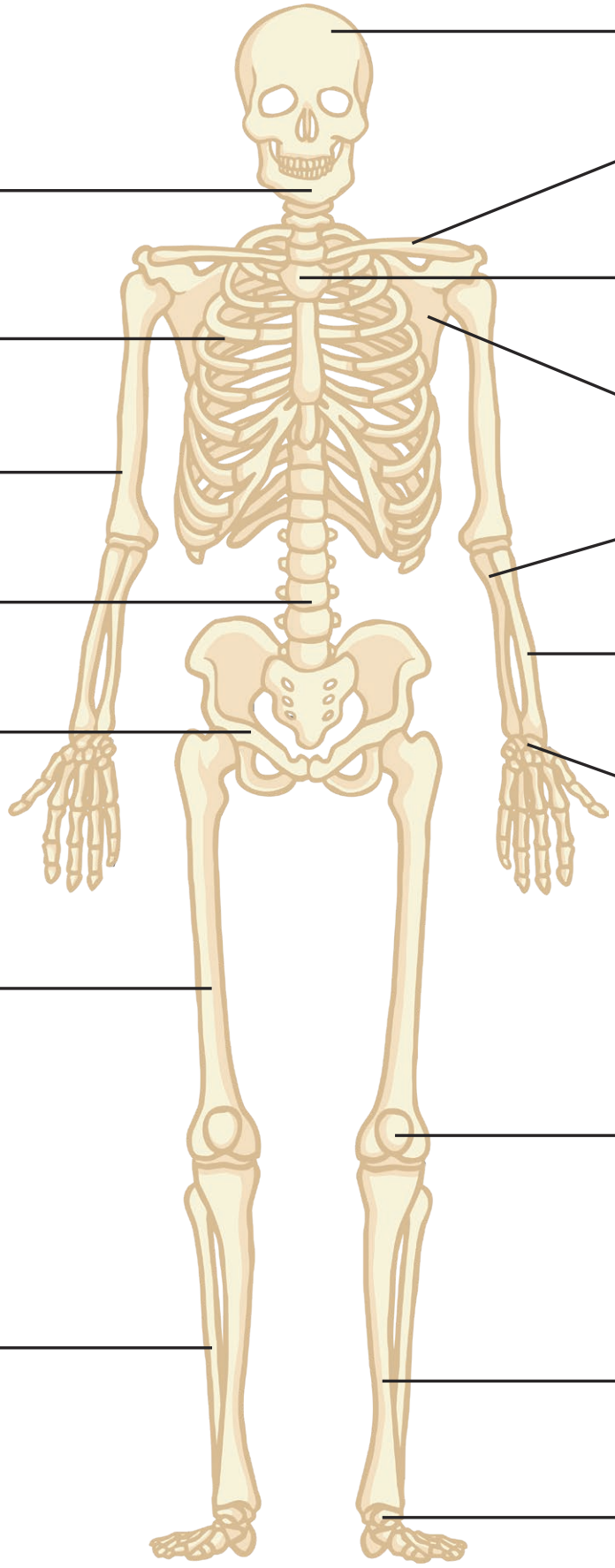
cranium
femur
fibula
humerus
patella
pelvis
radius
ribs
scapula
sternum
tibia
ulna
vertebrae



Skeleton Relay Diagram



Skeleton Relay Diagram



cranium (skull)

clavicle (collarbone)

sternum (breastbone)

scapula (shoulder blade)

ulna

radius

carpals (wrist bones)

patella (kneecap)

tibia

talus (ankle bone)

mandible (lower jaw)

ribs

humerus

vertebrae (spine)

pelvis

femur (thigh bone)

fibula

The Skeleton
Teaching Ideas

Learning Objective:	To explain the role of the skeleton in the human body.	Resources **Lesson Pack** Optional playdough/modelling clay cocktail sticks sticky notes/labels A4/A3 paper
Success Criteria:	• To identify the main bones in the skeleton. • To describe how the skeleton protects vital organs. • To explain how the skeleton protects against infection.	
Context:	This is the sixth lesson in the cells and organisation unit of work. Prior to this lesson students will have learnt about plant, animal and bacterial cells, and about the hierarchy of organisation. This lesson and the following lesson focus in more detail on the muscular skeletal system.	

Starter

The starter slide could be displayed on the board as students enter the room to get them thinking about the context of the lesson straight away. You could ask students to think about the questions on the slide independently or discuss in table groups, and you may want them to record their ideas on whiteboards or in their books.

Two of the questions ask about bones, and are there for you to assess the understanding that students have from key stage 2. The third question asks the students to describe what life would be like for us if we didn't have a skeleton, this starts to get them thinking about the role that the skeleton plays in the body.

Main Activities

Bones True or False

Slide 4 gives some statements about bones and asks the students to decide whether they are true or false. Side 5 explains the truth about each statement. The picture of the broken bone on the slide is useful to refer to when you talk about the fact that bones can repair themselves, an idea that students are likely to be familiar with if they have known someone who has broken a bone.

The first question on the **Skeleton Activity Sheet** (there are two ability versions of this) asks students to describe what a bone is, the first statement on slide 5 will help them to answer this.

The other points are interesting facts to act as a hook for the lesson.

Skeleton Relay

This is a fun activity designed to get the students learning the names of key bones and where they are on the skeleton. Groups of 3 work well for this activity, but you could make it work in pairs or 4s if that would suit your class better. One student comes to the front to look at the **Skeleton Relay Diagram** you have on the desk (available in A4 and A3). Set the timer and allow them 30 seconds to memorise all that they can before you send them back to the desk to draw what they can remember.

You could pause for 30 seconds before you have the next person to the front to look, or you could bring them up straight away. Keep bringing the students up in a relay until most groups have made a decent attempt at drawing a full skeleton. You might want to have multiple copies of the diagram on the front desk so that they aren't all crowded around one.

Remind the students that this isn't an art lesson, and you are more concerned with bones being in the correct place and labelled than you are with how they look. The teams that are most successful at this usually communicate with each other well and plan which part of the diagram each person should study next.

Follow on from the activity by showing the unlabelled skeleton on the board and picking students to name the parts you point to using their drawing. They can then fill in the key bones on their **Skeleton Activity Sheet**.

Skeleton Function

This activity provides a way to introduce students to the four functions of the skeleton. The **Organ System Function Cards** include the four functions, as well as some functions of other organ systems. The students are asked to choose which functions they think are carried out by the skeleton. The functions are also shown on slide 9. You may decide to tell the students they are looking for 4 different functions. Students are likely to identify that the skeleton provides support, protects organs and helps you move from their prior knowledge. The fact that the skeleton produces blood cells is often surprising to the students.

Slides 10-13 give some extra information about each of the functions. Students are asked to describe the functions of the skeleton on the **Skeleton Activity Sheet**. The lower ability sheet breaks down this question into four separate functions and provides keywords for support.

To add some revision of other organ systems, you could ask the students to sort the cards into the separate organ systems and name the systems that they think the functions relate to. The functions have been assigned to the correct organ system on the **Organ System Function Cards Answer Sheet**.

Joints

Slides 14 and 15 give information about three different types of joints and show examples of each. The cartilage, fluid and ligaments of the joints are labelled. Students are asked to explain what a joint is on the **Skeleton Activity Sheet**.

In pairs, ask students to make a simple version of the ball and socket and hinge joints using modelling clay or playdough. Display the diagrams on slide 15 to help them. Ask them to work with each other to make sure the colours of the cartilage, fluid, ligaments and bones are consistent between their two models. They could add flags to label the parts using cocktail sticks, or they could place their models onto paper or a whiteboard and label them on there.

There is space on the **Skeleton Activity Sheet** to stick down a photo of their models, alternatively, you may wish students to draw the two joints in this space instead.

Teacher note - Please check if there is anyone with an allergy to playdough/modelling clay before you conduct this activity. They may need to stay away from your classroom for the day.

Plenary

Skeleton Race

Split the class into teams and line one person from each team along the front of the classroom.

The rest of the team must take it in turns to run to the front, pick up a sticky note or label, write on it and stick it in the correct place on their team mate at the front. Once they get back to their team the next person can go.

The team who gets all the bones one the board labelled correctly on their team member first is the winner!

Teacher note – Please ensure that the students are respectful of each other during this activity and that they have their team mate's consent to be touched with the sticky notes.

Homework Activity

Ask students to make a model of a skeleton or a model of a joint, using whichever materials they have at home. You could provide some materials in class for students to take away with them if they don't have access to craft materials at home. Alternatively, they may want to bake a cake or other food item and decorate it as a model.

Teacher note – Again, please be aware of any allergies surrounding any modelling clay or baked items that the students may wish to bring into school.

How To Use a Microscope
Teaching Ideas

Learning Objective:	To explore the importance of biological sciences and be able to use a microscope to magnify objects, to see in more detail.
Success Criteria:	• To state some careers and scientific developments in the field of biology. • To use a microscope safely and magnify objects. • To be able to label the parts of a microscope and explain what they do.
Context:	The third lesson in the unit Introduction to Science. This lesson introduces biology, examples of careers in biology, a few examples of scientific discoveries in the field of biology and the use of a microscope.

Resources

Lesson Pack

Materials needed:

- Microscopes to view specimens.
- Pre-prepared slides.
- Objects to view through the microscope.

Starter

Careers in Biology

Ask the pupils to think of as many careers in the field of biology as they can. They can work in groups then come together as a class to put ideas together. Alternatively, they can work independently and hold up their ideas on whiteboards.

Scientific Discoveries

Ask the pupils to think of and discuss important discoveries/technology/ideas/developments in the field of biology. Again, they can work in groups or pairs then come together as a class.

Main Activities

Microscopes

Discuss the importance of the microscope. What are the smallest objects that the pupils have ever seen images of?

Show the pupils the parts of a microscope and demonstrate how to handle it safely. Alternatively, you can demonstrate using the **Parts of a Microscope Picture Hotspots.**

Parts of a Microscope

Ask the pupils to label the parts of a microscope on the **Activity Sheet**. Pupils can peer/self asses their answers afterwards.

Using the Microscope to Observe Objects

Demonstrate to the pupils how to use a microscope. At this point, you could ask them to copy the steps into their books with instructional diagrams.

Pupils then work in small groups to observe objects or pre-prepared slides through their microscopes. Pupils should draw or describe what they see in the **Microscope Observation** sheet provided.

Bring the class together to discuss any findings, such as difficulties with viewing objects/slides, handy tips for using a microscope.

Plenary

Biology Quiz: Complete the quiz on microscopes. Pupils can hold up their answers on whiteboards.

Microscope Observation

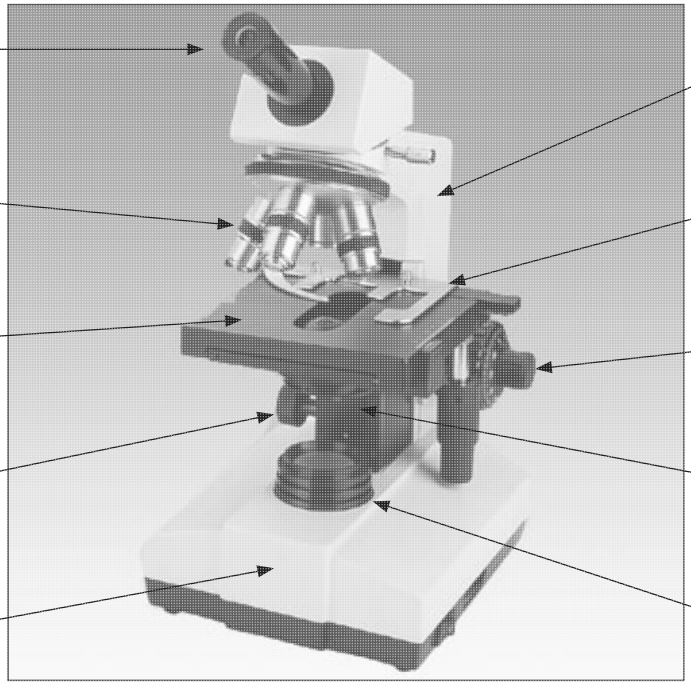
Object	Diagram/Observation

Microscope Observation

Object	Diagram/Observation

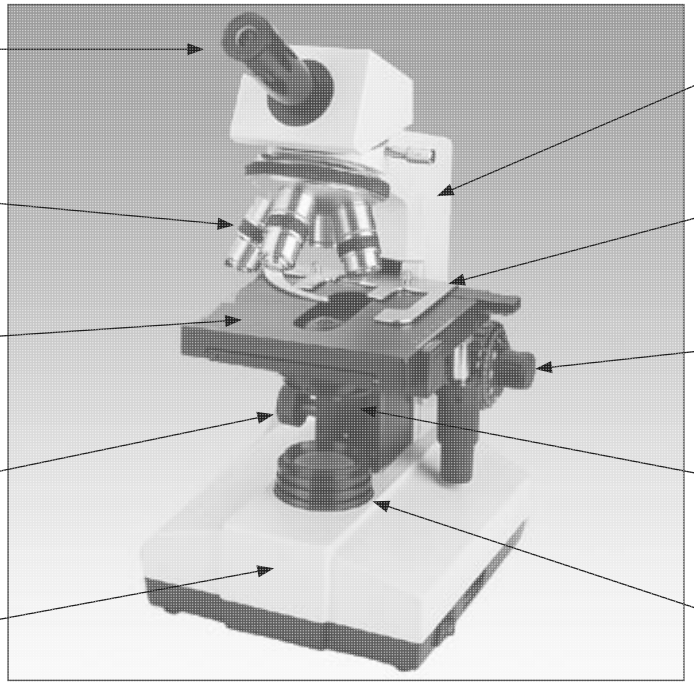
Parts of a Light Microscope

Cut out the labels and match them to the correct part on the diagram.



stage clips	diaphragm	eyepiece lens	base	objective lens
light source	coarse adjustment knob	stage	fine adjustment knob	arm

Parts of a Light Microscope - **Answers**



eyepiece lens

objective lens

stage

fine adjustment knob

base

arm

stage clips

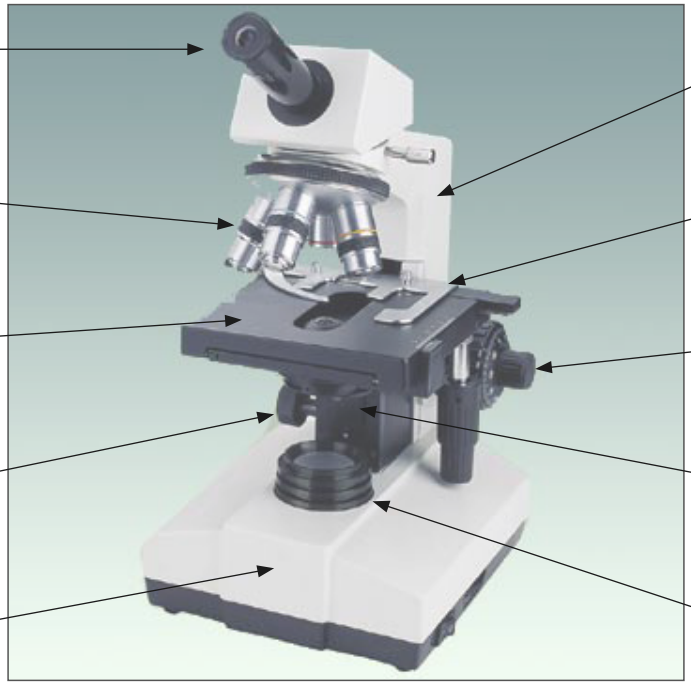
coarse adjustment knob

diaphragm

light source

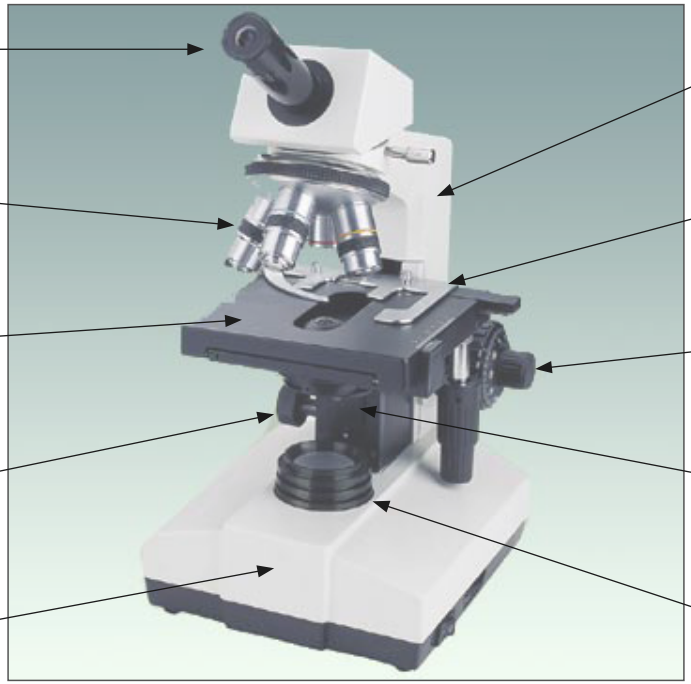
Parts of a Light Microscope

Cut out the labels and match them to the correct part on the diagram.



stage clips	diaphragm	eyepiece lens	base	objective lens
light source	coarse adjustment knob	stage	fine adjustment knob	arm

Parts of a Light Microscope - **Answers**



eyepiece lens

objective lens

stage

fine adjustment knob

base

arm

stage clips

coarse adjustment knob

diaphragm

light source